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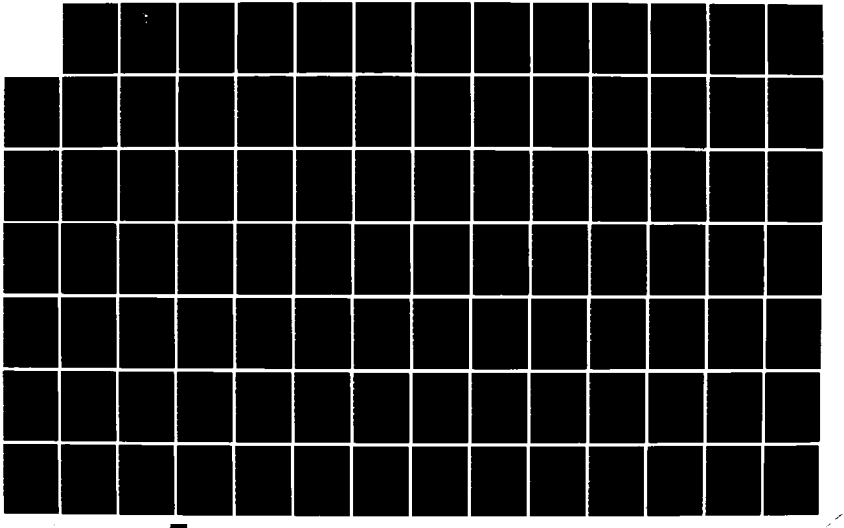

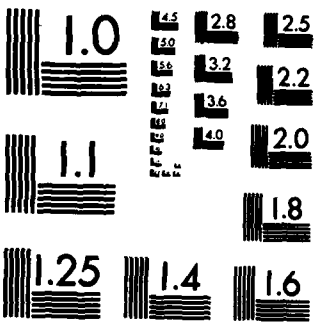
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# IDENTIFICATION AND IMPORTANCE OF OFFSETTING COSTS IN COMPONENT BREAKOUT

THESIS

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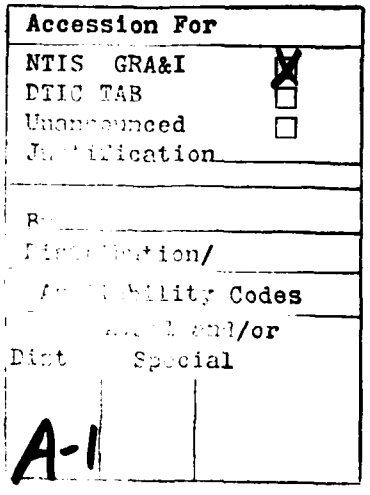


AFIT/GLM/LSM/84S-31

# IDENTIFICATION AND IMPORTANCE OF OFFSETTING COSTS IN COMPONENT BREAKOUT

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

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## Abstract

Twelve guidelines are provided in DAR and DOD FAR Supplement for assessing the risks and benefits of component breakout. One of the guidelines identifies examples of offsetting costs that should be considered when estimating the potential cost savings of component breakout. However, this list is not inclusive of all the costs that offset the potential cost savings of component breakout. This research effort proposes a composite list of offsetting costs associated with component breakout and provides an assessment of the importance of each offsetting cost to a breakout decision.

The researchers identified, through a review of contract files, and a search of literature, fourteen general categories of offsetting costs. Twenty-one component breakout experts were then asked to rank the offsetting costs. By ranking the offsetting costs, the researchers were able to determine the relative importance of each offsetting cost to a breakout decision.

A nonparametric statistical test was conducted by the researchers to determine the agreement among the experts on the importance of each offsetting cost to a breakout decision. The results of the test indicate that the twenty-one

experts generally agree on the importance of each offsetting cost. Manpower was identified as the most important offsetting cost.

The first essential step to establishing a realistic estimate of the potential cost savings of component breakout is to identify the offsetting costs. The next step is to evaluate each offsetting cost using a method of analysis that accurately predicts the impact of the particular cost. However, neither quantitative nor qualitative guidance has been developed for analyzing offsetting costs.

The researchers recommend that methodologies be developed to forecast and evaluate each offsetting cost. Lacking such methodologies, not only is the potential for misjudgment of cost savings high, but erroneous breakout decisions could result.

# IDENTIFICATION AND IMPORTANCE OF OFFSETTING COSTS IN COMPONENT BREAKOUT

## I. The Research Problem

### Introduction

In response to Congressional concern over rising weapon system costs, and reports of success with component breakout in the Army, the Air Force began its efforts to develop a component breakout program in the late 1950's (23:108). Component breakout was viewed by Congress as a special method of contracting that could lead to significant life cycle cost savings as well as increase the level of competition during the major weapon system acquisition process (23:105).

Since the late 1950's quantum leaps in technology and military development in such areas as electronics, aerospace, communication, computers, and high energy weapons have taken place. Along with these advancements have come even greater cost growths in Air Force major weapons acquisition. In addition, the 1980's have brought with them a growing demand for public funds to support other government projects, leaving a smaller portion of the federal budget available for the Department of Defense (DOD). Because major weapon system acquisition is the largest and fastest growing portion of the defense budget, cuts in defense programs make the already

complex Air Force weapons acquisition process even more difficult to control (22:284).

Recognizing the increased challenges of the acquisition environment that have transpired over the years, Congress and other high ranking officials have found it necessary to place even greater emphasis on the use of contracting methods that offer cost savings to the government (24). Thus, component breakout has continued to receive high level attention in the 1980's.

What is "component breakout"? A definition of component breakout and other terms associated with component breakout are provided in Appendix A. In addition, the next section of this chapter will describe component breakout and will briefly highlight DOD's policy on component breakout.

## Background

As described in DAR and continued in the DOD Supplement to the FAR, component breakout occurs when the government purchases a component previously furnished as contractor furnished equipment (CFE) and provides it to the prime contractor for incorporation in the end item (8:1-326.2; 9:17.7202-1). By the government purchasing a component of an end item and providing it to the prime contractor as government furnished equipment (GFE), the indirect costs and profit charged by the prime contractor are absorbed by the government (4:1).

Component breakout can take place in two ways, as illustrated in Figure 1: (1) by direct non-competitive purchase

from the subcontractor or vendor, or (2) by competitive purchase of an end item previously purchased non-competitively by the prime contractor.

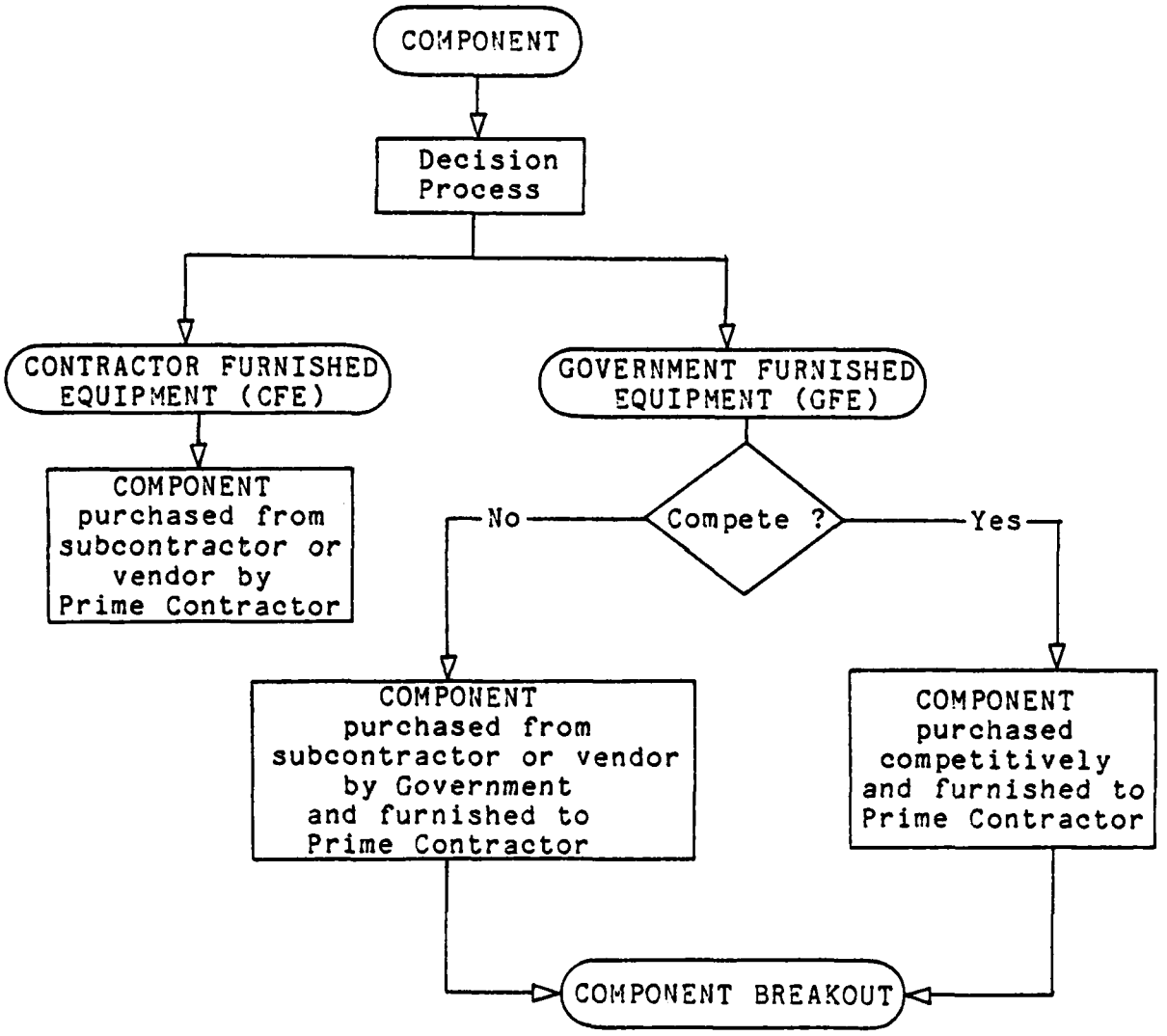



Figure 1. CFE vs. GFE

The policy of the Department of Defense is to break out a component:

> 1. whenever it is anticipated that the prime contract for a major weapon system or other end item will be awarded without adequate price competition (a) if substantial net cost savings will probably be achieved and (b) the action will not jeopardize the quality, reliability, performance, or timely delivery of the end item, and
>
> 2. whenever substantial cost savings (regardless of whether the prime contract or component being purchased by the prime contractor is on the basis of price competition) will result from (a) greater quantity purchases or from factors such as (b) improved logisitics support through reduction in the variety of spare parts and (c) economies in operations and training will be achieved through standardization of design [8:1-326.2; 9:17.7202-2].

Primary consideration for breakout should be given to components of weapon systems or other major end items that represent the highest annual procurement costs and offer the largest potential net cost savings over the life of the major weapons acquisition process. Although it will seldom be applicable to acquisitions of systems of less than $1,000,000, each component should be evaluated on its own merits for breakout consideration (8:1-326.1; 9:17.7202-1).

For major weapon system programs, a team of experts is designated to determine which components will be broken out and provided to the prime contractor as government furnished equipment. The team is headed by either a program manager, project manager, program director, or other appropriate individual and supported by project team members to include a Small Business Specialist; cognizant engineering, production,

logistics, maintenance, pricing, and contracting personnel; and other individuals as appropriate for the component in consideration (8:1-326.3; 9:17.7202-3).

Implicit in DOD's policy of providing government furnished equipment to the prime contractor is the requirement of the team of experts to assess the potential risks and benefits of breaking the component out. The DAR and DOD FAR Supplement provide guidelines in the form of questions that cover a wide range of factors pertinent to the component breakout selection process. The thrust of DOD's component breakout policy is to achieve substantial net cost savings over the life of the major weapon system acquisition process by eliminating the middle-man role performed by the prime contractor. In essence, if the benefits to be achieved are great and the risks are acceptable, the component should be broken out. However, if the risks are not acceptable, the component should be provided as CFE, and the feasibility of eliminating the conditions currently unfavorable to breakout should be considered (8:1-326.4; 9:17.7202-4).

## Significance of the Problem

A review of DAR 1-326 and DOD FAR SUP 17.7202 reveals that the guidelines established for component breakout identify numerous factors to be considered when making a breakout decision. It should be noted, however, that DAR and DOD FAR Supplement do not specify the relative importance of the various factors to be considered in the breakout decision

process. As noted in a Missile Acquisition Study conducted in 1979 by the Logistics Management Institute (LMI):

> DAR 1-326 sets forth guidelines for assessing potential risks, calculating estimated savings and analyzing the technical, operational, logistic and administrative factors involved in the GFE/CFE decision. However, it provides no guidance as to the relative importance of the various factors and no sequence for their consideration. Thus, acquisition personnel are required to make decisions based on their own perceptions of the degree and significance of the risks involved and the estimated cost savings [26:4-3].

When an item is furnished as contractor furnished equipment, the costs associated with the subcontracted item are reflected in the prime contract. However, if an item is furnished as government furnished equipment, the costs are largely shifted to the Government. Thus, the key to determining the cost effectiveness of GFE is to establish a realistic estimate of the potential net cost savings to the government of providing the component directly to the prime contractor.

Establishing an estimate of potential net cost savings of component breakout is not an easy task, but is vitally important to the component breakout selection process. Without careful consideration of important cost elements, not only is the potential for misjudgment of cost savings high, but erroneous breakout decisions could result if the estimate of cost savings is inaccurate.

The question "Will breakout result in substantial net cost savings?" is posed as one of the breakout guidelines

provided in DAR and DOD FAR Supplement. Beyond this general guideline, no definitive guidance has been developed in the DOD or in the Air Force to assist the team of breakout experts in performing an analysis to determine the offsetting costs before a breakout decision is made. As a result, breakout decisions have been inconsistent, as have the estimates of potential savings of component breakout.

These findings were supported in four recent studies: (1) a 1980 study conducted by the House Appropriations Committee's Surveys and Investigations Staff (SIS80), (2) a 1980 Air Force Audit Agency Report (AFAA80), (3) a 1980 Navy Study conducted by Cohen (COHEN80), and (4) a 1983 study conducted by the Army Procurement Research Office (APRO84).

The First Study (SIS80). In 1980 the House Appropriations Committee directed their Surveys and Investigations Staff to review the military services' component breakout practices. During the review, the Surveys and Investigations Staff found a number of cases where it appeared that (1) component breakout programs had not been fully implemented, (2) no set procedures had been established to identify components susceptible for breakout, (3) factors relevant to the breakout decision had not been evaluated, and (4) documentation had not been produced as required by DAR 1-326 (23).

The Second Study (AFAA80). During the same time period, Air Force Audit Agency (AFAA) conducted an audit of nine Air Force programs within the Air Force Systems Command -- six

programs from the Aeronautical Systems Division and three systems from the Electronic Systems Division. While the overall objective of this audit was to evaluate the implementation of the Air Force component breakout program, the sufficiency and reliability of cost analyses and documentation supporting decisions for or against component breakout actions were also evaluated (4:1).

The audit findings indicate that overall the component breakout program in the Air Force could be more effective. A wide range of program implementation exists among system program offices. Three program offices reviewed had effective and aggressive programs, with projected savings of $113 million to $138 million at the time the breakout decision was made. However, six other program offices had not aggressively pursue component breakout programs. From the selective review of CFE lists, possible candidates were identified within the F-15, F-16, A-10, B-52, and TRI-TAC Troposcatter program offices (4:2).

In the area of cost analysis, the audit identified inconsistencies (1) in considering offsetting costs associated with component breakout, (2) in calculating breakout savings, and (3) in the method of determining offsetting costs. Further, documentation to support component breakout decisions was not maintained (4:2-3)

The Third Study (COHEN80). In another study entitled "Government Furnished Equipment: An Analysis of the Decision-

Making Process" also conducted in 1980, Cohen reported that when collecting data for the study, comments were received during interviews with personnel involved in component breakout that "all too frequently Government personnel look just at the projected savings achieved by avoiding the prime contractor's middle-man burden, and overlook the hidden costs for which the government assumes responsibility when providing the item as government furnished property. The hidden costs can partially, if not totally offset the paper savings that are reported [2:72]."

The Fourth Study (APRO84). The issue of "cost" and component breakout is still alive and unresolved in 1984. A special report was issued by the Army Procurement Research Office (APRO) in January 1984. In this report, APRO identified two issues that complicate the process of estimating the costs of component breakout:

> 1. The types of cost expected to be incurred have not been identified.
>
> 2. Can the level of effort required for each cost element be realistically estimated? Precise estimation of each effort would require a sophisticated and comprehensive work measurement and projection system. Unfortunately, no comprehensive system is yet in place [6:4-5].

## Problem Statement

The four studies -- SIS80, AFAA80, COHEN80 and APRO84 -- indicate a need for further guidance in developing estimates of cost savings of component breakout. The first essential step of this process is to identify the offsetting costs that take

away from the potential cost savings of component breakout. At the present time the Air Force has not identified a composite list of offsetting costs associated with component breakout. One of the twelve guidelines provided in DAR and DOD FAR Supplement for assessing the risks and benefits of component breakout identifies examples of offsetting costs that should be analyzed; however, this list is not inclusive of all the offsetting costs associated with component breakout. Thus, there is a need to identify a composite list of offsetting costs related to component breakout and to assess the importance of each cost to a breakout decision.

Without careful consideration of all offsetting costs associated with a component, potential savings could be misjudged and erroneous breakout decisions could result. By identifying the offsetting costs important to a component breakout decision, not only should the estimate of potential net savings improve, but the overall component breakout decision should be more accurate and consistent.

## Scope of Research

This research effort is limited to the study of components of major weapon systems and other items of major equipment, governed by DAR 1-326 and DOD FAR SUP 17.7202. Excluded from this research are components that are (1) furnished as GFE/CFE at the inception of the major weapon system program, (2) items acquired as high-dollar spare parts during initial provisioning or for inventory support and (3) items of small

annual purchase value.

By limiting the scope of this research to components of major weapon systems, a more comprehensive review of a representative sample of breakout efforts will be possible. In addition, the researchers contacted each division in Air Force Systems Command (AFSC) to determine the total number of components currently broken out within the command. The researchers found that the Aeronautical Systems Division (ASD) accounts for approximately sixty percent of AFSC's component breakout efforts. Since the researchers are located at the same site as ASD, the data and resources needed to accomplish the research objectives are readily available.

## Research Objectives

1. To identify the offsetting costs associated with component breakout.

2. To assess the importance of each offsetting cost to a component breakout decision.

## Research Questions

1. What offsetting costs are associated with component breakout?

2. What offsetting costs are most important to component breakout decision?

## General Research Plan

The general research plan developed by the researchers is presented in this section. The research effort is divided

into two phases. Each phase corresponds to a single research objective and associated research question. The research question will be used to answer the research objective for each phase. In addition, research objective two will build on the results of research objective one (see Figure 2).

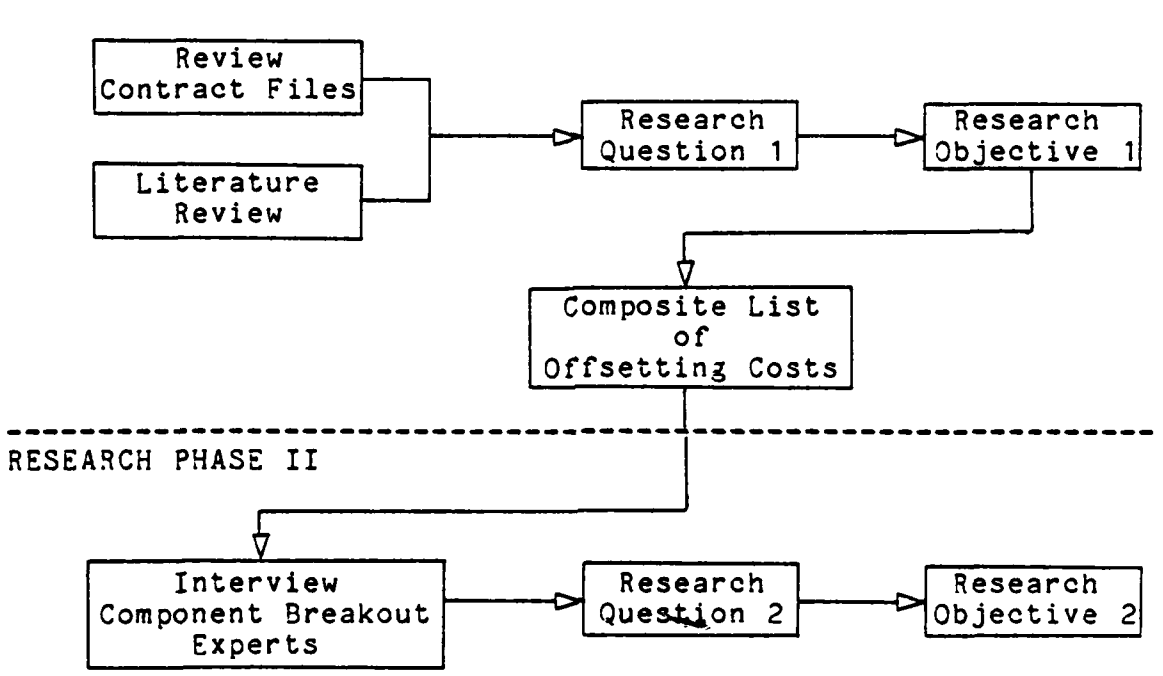



Figure 2. Research Plan

The first phase of the research will consist of identifying a composite list of offsetting costs associated with component breakout. To accomplish this task, data will be obtained from two sources: (1) contract file documentation maintained on current component breakout efforts and (2) a review of literature on component breakout.

The composite list of offsetting costs identified in Phase I will be used to develop a questionnaire to be administered to component breakout experts as part of Phase II. The experts will be asked to assess the importance of each offsetting cost identified on the questionnaire. By obtaining questionnaire results, research objective two will be met.

## Organization of the Study

This research study is reported in the remaining four chapters. Chapter II provides a chronological development of happenings and events relating to component breakout over the past twenty-five years. Included in the discussion are reports of research conducted on component breakout and resulting concerns of Congress and others over implementation of DOD's component breakout policy.

Chapter III describes the methodology used to accomplish the research objectives and answer the research questions identified in Chapter I. The methodology is developed as a step-by-step problem solving process. Key areas described are the nature and sources of data, the data collection process, and the data analysis techniques. Finally, the assumptions and limitations of the research are described.

Chapter IV addresses the two research questions and analyzes the data collected from component breakout file documentation and structured interviews with component breakout experts. The procedures described in Chapter III

will be used to process and analyze the data.

Chapter V summarizes the research findings, provides the researchers conclusions to the research findings and presents recommendations for research in the area of offsetting costs and component breakout.

## II. Historical Perspective of Component Breakout

### Overview

The purpose of this chapter is to establish a foundation for understanding the current direction of component breakout implementation in the Air Force, as well as other military services. To accomplish this task, a chronological development of happenings and events relating to component breakout over the past twenty-five years will be presented. Specifically, significant changes in the weapons acquisition environment that have affected component breakout practices will be addressed. In addition, findings and conclusions reported in previous research studies on component breakout will be identified. Finally, the chapter will conclude with a summary of "what has been learned" about component breakout implementation in the military services since the 1950's. Key issues or problem areas currently affecting component breakout implementation will be highlighted.

### 1950's - The Beginning of Component Breakout

During the 1950's, as weapon systems became more complex, the prime contractors of major weapon systems found they did not possess the capability to furnish all the complex components of a major weapon system. Thus, the prime contractor sought the assistance of other contractors or vendors who were able to manufacture or supply weapon system component parts. However, as a price for taking on the responsibilities of

managing the acquisition of the component and for assuming integration responsibilities, the prime contractor added such costs as material costs, material overhead, subcontractor costs as well as a second tier profit factor to the Government's total cost of the system (19:103).

Recognizing the added costs charged by the prime contractor for performing the "middle-man" functions, the Government sought to eliminate these costs by taking on the prime contractor's middle-man role. In the late 1950's, the Government, led by the Army, began its breakout efforts by purchasing components directly from the subcontractors and providing them to the prime contractor as GFE (19:103-104). Additionally, the timing was right because many of the post-World War II weapons had begun to mature and stabilize, making the weapon system integration function less complex.

1960's - A Period of Active Component Breakout

Success with the Army's breakout program in the late 1950's, which in the Nike-Hercules program alone reported savings greater than $11.3 million, led to Congressional insistence that the Air Force as well as the Navy formalize and initiate their own component breakout programs (19:108). Congress not only viewed component breakout as a means of achieving cost savings by eliminating the prime contractor's middle-man role, but as a means of possibly increasing the level of competition in weapons acquisition (19:105).

During this same time period Secretary of Defense

(SECDEF) Robert F. McNamara, shortly after taking office, directed that component breakout planning be incorporated into the military services' procurement planning program. As part of the directive, the military services were required to initiate plans to acquire technical data packages so that maximum competition could be sought during the breakout process (25:906).

McNamara, in attempting to improve the effectiveness of the acquisition system, established goals for the military services to achieve in several areas, one of which was component breakout. However, it was difficult for the SECDEF to track any progress toward the goals because an adequate management and information reporting system had not been established in the DOD (20).

In 1962 the LMI, contracted with the Diebold Group, Inc., (a management consulting group) to recommend quantitative indices which would enable the DOD to determine managerial performance as well as trends and progress toward established goals. One of the recommendations of the Diebold Group was a breakout savings index which would permit an evaluation of the cost-effectiveness of the breakout program, and aid in making decisions regarding the degree of component breakout implementation. As suggested by Diebold, the index would be derived by establishing the annual gross savings attributable to the breakout program as well as the total direct and indirect costs incurred in accomplishing the breakouts. By subtracting these two figures, the net savings resulting from the breakout

could be determined. The gross and net savings could then be calculated as a percentage of the savings objectives established by the SECDEF. Savings from individual procurement actions would be calculated by subtracting the actual unit price from the best estimate of previous unit price and multiplying the difference by the number of units procured (20).

The Breakout Savings Index suggested by Diebold could have been useful to the DOD in tracking component breakout implementation in the military services; however, the index was never applied.

Despite all the attention from Congress and other high ranking officials, the DOD did not issue a formal regulation covering its component breakout policy until 1 December 1965. At this time an amendment to the Armed Services Procurement Regulation (ASPR) was issued, which provided for DOD's policy and guidance on component breakout implementation (8:1-326).

Considerable breakout activity took place during the 1960's, especially for those weapon systems which had entered production and were relatively stable. For example, in 1965 the Navy converted forty-three components to GFE in the P-3, H-46, F-4, and A-6 aircrafts at reported first year savings of over $19.2 million (2:35). Despite the fact that the reports of cost savings did not take into account the "hidden costs" of managing GFE, the prospects for achieving significant cost savings through component breakout looked promising.

## 1970's - A Period of Minimal Component Breakout

During the late 1960's and early 1970's, however, many of the procurement policies instituted during the "McNamara Era" were being challenged by numerous agencies and high ranking Government officials. For example, shortly after the Nixon Administration took over, then Deputy Secretary of Defense David Packard, noting the cost growths experienced in the 1960's, issued major policy guidance to the Service Secretaries on ways to improve weapon system acquisition (18). A few months later, in November 1969, the Congress, also showing concern over the problems experienced in the 1960's, created the Commission on Government Procurement (COGP) to study the procurement practices of the Government and to make recommendations for improvement (2:121).

Cohen, in gathering historical research data for his study on CFE/GFE decision making, noted that it was difficult to assess the impact the problems experienced in the 1960's had on component breakout practices in the 1970's. However, there was no doubt that the many problems which led to the new SECDEF procurement policy guidance and to the establishment of the COPG left an impact on component breakout decision makers (2:121).

When conducting personal interviews with a number of acquisition personnel, Cohen found that the responses given by the interviewees were evidence of the impact the problems of the 1960's had on component breakout practices in the 1970's.

Some of the reasons cited by the interviewees for the decline in component breakout were: (1) a reduction in the degree of emphasis being placed on component breakout during the 1970's, (2) the effect that past problems have had on the program manager's willingness to assume the risks associated with component breakout, (3) the increased risks assumed by program managers as a result of increases in the complexity of modern weapon systems and reductions in personnel resources available to manage GFE, and (4) the strong emphasis placed on meeting schedule, performance, and logistics support requirements by program office personnel (2:121-128).

In any event, with the 1970's came many changes in the acquisition environment. The component breakout policy set forth in DAR remained intact, but the emphasis placed on component breakout in the 1960's was no longer present in the 1970's. Minimum breakout activity was taking place in the military services. This "minimal" breakout response was noted in an Air Force Audit Agency Report, dated 12 October 1976, stating that the F-15 System Program Office (SPO):

> (1) had not identified all components with breakout potential and had not adequately prepared items for breakout; and (2) had insufficiently documented the need to defer breakout of 15 candidate items, reviewed in 1974 and 1975 [23:281].

Similar deficiencies with regard to breakout practices in the Army Aviation Systems Command and the Army Missile Command were reported in a 1975 Army Audit Report. The audit agency found that component breakout was not fully implemented in the

commands and as a result were not realizing the potential savings that could be achieved through breakout. The audit agency recommended that the Army's Materiel Command place more emphasis on the importance of improving breakout procedures and that a means for monitoring breakout programs in subordinate commands should be established (5:5).

In response to the 1975 Army Audit, the chief of staff of the Army Aviation Systems Command (AVSCOM) directed the Systems Analysis Office, AVSCOM, to perform an in-depth study of the AVSCOM Component Breakout Program. The Systems Analysis Office found (1) AVSCOM did not have an active Component Breakout Program, and (2) although ASPR paragraph 1-326 and AVSCOMR 700-32 offer feasible procedures for operating a fruitful breakout program, AVSCOMR 700-32 did not assure full compliance with ASPR paragraph 1-326. Management responsibilities for component breakout had not been assigned to a specific individual. Thus, the Systems Analysis Office proposed a management structure to help get the AVSCOM Component Breakout Program going (20:16).

## Current Trends in Component Breakout

High level concern over the adequacy of the military services' compliance with DOD's component breakout policy continued into the late 1970's and on to the 1980's. For example, in a report submitted with the 1980 Department of Defense Appropriations Bill, the House Committee on Appropriations cited two recent Air Force Audit Agency reports which

indicated that various Air Force programs were not complying with DOD's component breakout policy (24:266).

In one report, once again involving the Air Force F-15 program, it was noted that (1) component breakout reviews did not address all the items eligible for breakout consideration, (2) a management decision not to breakout 12 components on the F-15 resulted in additional costs of approximately $4.2 million, and (3) breakout of other items could have resulted in cost avoidances of an additional $15 million (24:266).

The second Air Force Audit Agency report cited that a specific component breakout program had not been established for aircraft and that savings of approximately $6.7 million could have been achieved had breakout of equipment common to several aircraft taken place (24:266).

Based on the findings of the above mentioned audits, the House Appropriations Committee concluded:

> ...these audit reports demonstrate that too little attention is being devoted to the component breakout program. The component breakout program should be applicable across every item of equipment built for the military departments. Aircraft engines have been a high-dollar government furnished equipment item for many years and there is no reason why other engines, fire control systems, navigation systems and other much smaller components cannot be purchased directly from the manufacturers once the end item enters production [24:266].

This report went on to request that the Secretary of Defense "give his attention to the operation of this program in the military departments [24:266]."

On August 15, 1979, the House Appropriations Committee tasked its Surveys and Investigations Staff to study DOD's

compliance with their own component breakout policy. In the study, which lasted until April 1980, the Surveys and Investigations Staff found that, in general, DOD activities were not complying with the component breakout policies found in DAR. In addition, component breakout practices varied considerably among programs and agencies (23). As noted in Chapter I, a number of cases were found where (1) component breakout programs had not been fully implemented, (2) no set procedures had been established to identify components susceptible for breakout, (3) factors relevant to the breakout decision had not been evaluated, and (4) breakout decisions were not documented as required by DAR 1-326 (23).

Based on these findings, the Surveys and Investigations Staff recommended, among other things, that:

> ...standard procedures and record formats be established for mandatory use within the DOD to ensure that potential breakout candidates are promptly and properly identified and that all factors relevant to the breakout decision process are addressed, and where appropriate quantified [23:iv].

The 1980 Air Force Audit Report, discussed in detail in Chapter I, provides one more piece of evidence to support the 1970's trend of minimal breakout activity in the military services (refer to pages 7-8 of this thesis).

Current Component Breakout Research

During the period from 1978 to the present, research relating to component breakout concentrated mainly on the CFE/GFE decision selection process. For example, in 1978, an Air

Force study was conducted by Dillard & Inscoe to identify and define the management cost elements that should be considered in the GFE selection process (10:12-13). Sixty-five elements of management cost were identified in the study. A sample of CFE/GFE decision makers were asked to assess the importance of the sixty-five cost elements. Forty-nine (seventy-five percent) of the cost elements were judged important to a CFE/GFE decision; however, only one of the forty-nine elements has been frequently used in past cost analyses. Thus, Dillard & Inscoe concluded that CFE/GFE management cost analysis is currently inadequate (10:50-51).

Another concern of Dillard & Inscoe was to develop a list of "practical" management cost elements. A cost element was defined as practical if it was measurable, available and cost effective. Forty of the sixty-five cost elements were identified as not measurable and available. From this finding Dillard & Inscoe concluded that a majority of the cost elements cannot currently be used on a practical basis. Because sufficient data does not exist for the majority of cost elements, Dillard & Inscoe further concluded that an effective standard procedure for management cost analysis cannot be developed at this time (10:51).

As cited previously, a comprehensive Navy research study was undertaken by Cohen in 1980 to examine and analyze the CFE/GFE decision-making process as it related to decisions made for and during the production phase of the weapons acquisition process (2:11).

Through an extensive literature review, personal interviews with Government acquisition personnel and a review of case studies, Cohen found that (1) DAR did not adequately cover the CFE/GFE decision-making process, (2) program managers did not utilize a component breakout strategy to the maximum possible extent, and (3) the component breakout practices for weapon system programs varied considerably, and in many instances, did not comply with DOD's component breakout policy and guidance as set forth in DAR (2:4).

The major contribution of the Cohen study was the formulation of an aircraft/missile Component Breakout Decision Model which was designed to be used in conjunction with DAR 1-326 guidelines. The model was intended to form a basis for structuring and implementing component breakout programs and in making breakout decisions. Recognizing that operations and weapon systems' characteristics vary to a considerable degree, no attempt was made by Cohen to establish specific procedures to be followed in implementing component breakout programs. Rather, a generalized approach was used to develop the decision model. Three key phases make up Cohen's model. They are: (1) the Component Identification Phase - components susceptible for breakout are identified, (2) the Preliminary Analysis Phase - cost, schedule, and performance factors are evaluated, and (3) the Detailed Analysis/Breakout Decision Phase - risks and benefits of converting from CFE to GFE are assessed and a decision is made as to whether the component should be broken out (2:130-157).

In 1981, a study was also conducted on the CFE/GFE decision process by the Army Procurement Research Office (APRO). Through a review of existing literature and policy guidance CFE/GFE decision approaches and personal interviews with program management personnel regarding CFE/GFE decisions, APRO identified a set of factors that should be considered when making a CFE/GFE decision. As noted by APRO, because each system environment is unique, the factors to be considered for each decision are highly situational dependent (7:15-25). Based on these research findings, APRO developed a generalized model of the CFE/GFE decision process, and incorporated in the model a method of analysis called hierarchical decomposition which is sufficiently flexible to accommodate variations in individual program environments and requirements (7:26-30).

The study concluded with APRO recommending that the Army Materiel Development and Readiness Command (DARCOM) develop policy guidance on conditions for use of GFE. In addition, APRO recommended that DARCOM consider the use of a structured technique for performing applicable CFE/GFE analyses, such as hierarchical decomposition (7:32).

The most recent research relating to component breakout was a study conducted by APRO in December 1983. At the request of the DARCOM's Deputy Commanding General for Research, Development and Acquisition, APRO sought to determine the feasibility of determining GFE/CFE cost effectiveness (6:1). The following conclusions were derived from the study:

1. The GFE/CFE decision process is multifaceted and

highly situational in nature. At the present time it cannot be estimated with any degree of confidence which method is generally more cost effective. Case-by-case analyses must be performed for individual systems.

2. Based on preliminary literature reviews, the methodologies used to make case-by-case analyses are neither standardized nor comprehensive. Available literature concerning GFE-use decisions was very limited. In addition, the level of documentation in the few decision reviewed was insufficient to permit a determination of the methods employed. Consequently, historical data on which to base a determination of the relative cost effectiveness of GFE/CFE was not identified (6:7-8).

The future research needs suggested in the APRO study were (1) the identification of any prescribed or officially recommended techniques for analyzing the overall risks attendant to GFE or CFE in terms of its subelements, and (2) the establishment of a data base for estimating Government administrative costs (6:8-9).

## "What Has Been Learned" About Component Breakout?

The purpose of this chapter was to establish a foundation for understanding of the current direction of component breakout in the Air Force, as well as other military services. Numerous research studies conducted on component breakout have identified key issues and problem areas currently affecting component breakout implementation. In addition, significant changes have taken place in the acquisition environment that

have affected component breakout implementation. This last section of Chapter II will summarize what has been learned about component breakout from the past:

1. Component breakout practices for weapon system programs vary to a considerable degree and, in many instances, do not comply with DOD's component breakout policy and guidance provided in DAR. While some weapons programs have implemented well-structured component breakout programs, many others have not established sound procedures for identifying components susceptible for breakout. In addition, little in the way of documentation is being maintained to substantiate reasons why decisions were made to not break-out components.

2. Many changes and developments have taken place in the acquisition environment over the past twenty-five years that have had a marked impact on the GFE/CFE decision-making process. However, the key factor affecting all others is the increased complexity of major weapon systems.

3. The high incidence of GFE related problems experienced by the acquisition community have had a marked impact on the willingness of program managers to convert components from CFE to GFE. Although the decision to provide GFE does, by its very nature, increase program risks, there are also cost savings benefits that can be gained from breakout.

4. Numerous instances have been found where acquisition personnel have based their breakout decisions on one or two overriding factors, without first considering and evaluating all relevant decision factors. The costs and benefits must be

weighed before a rational business decision can be made. If cost savings can be achieved through breakout, all other benefits and program risks must be identified to insure the best interests of the Government are being served.

From the above summary it is evident that an adequate set of tools for estimating either the benefits or the costs of component breakout have not been developed. Most of the research that has been conducted on component breakout has focused on the degree to which component breakout is or is not applied. The emphasis needs to be changed. The focus of future research needs to be on identifying methods of analysis for evaluating the costs and benefits of breakout. It is not enough simply to have faith that the breakout process will lower costs by some amount. A forecast of the costs and benefits of component breakout is needed in order to judge whether the savings are likely to be sufficiently greater than the costs incurred by the breakout process.

Identifying a composite list of offsetting costs is a preliminary step that must be taken before any method of analysis can be applied to evaluate the potential costs and benefits of breakout. Without careful consideration of all offsetting costs associated with a component, potential savings could be misjudged and erroneous breakout decisions could result. The objectives of this research study are to identify a composite list of offsetting costs associated with component breakout, and to assess the importance of each offsetting cost. Chapter III will describe the methodology used by the researchers to accomplish the research objectives.

# III. Research Methodology

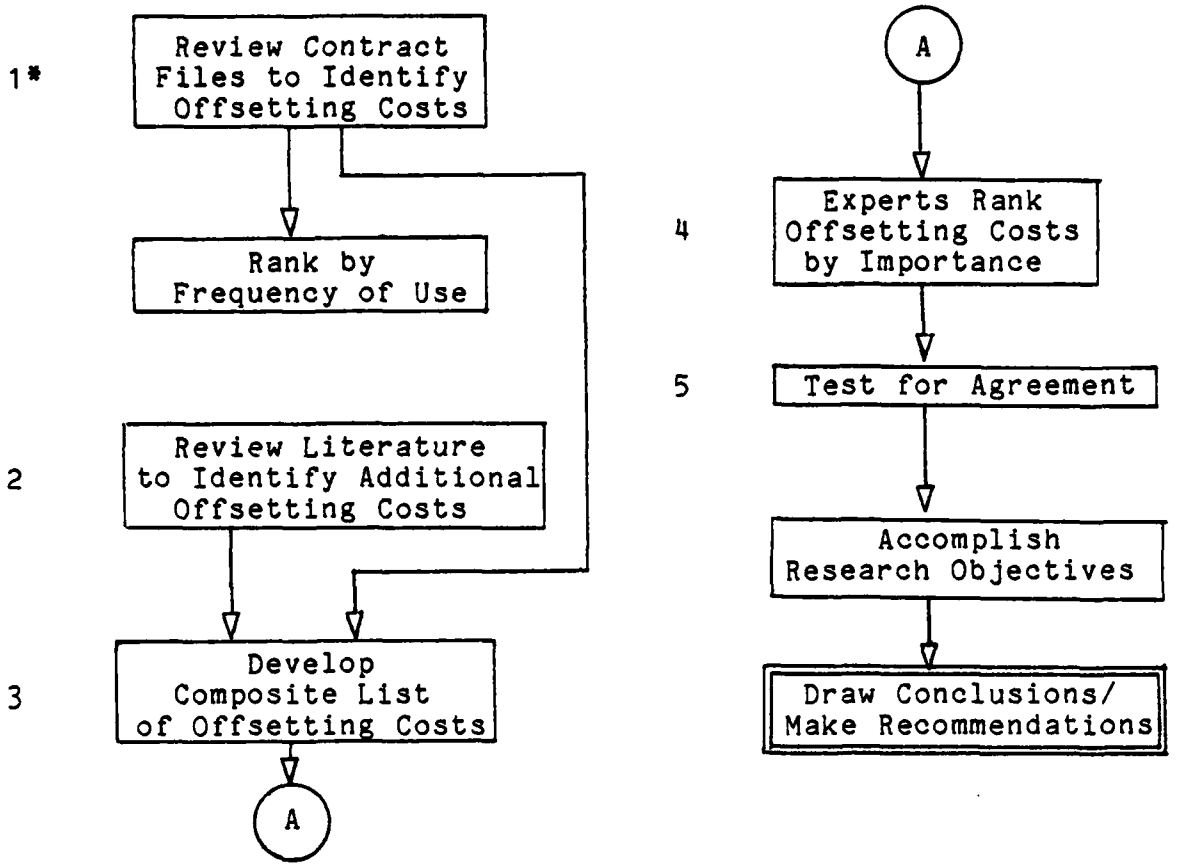
## Overview

This chapter describes the research methodology that was used to accomplish the research objectives and answer the associated research questions identified in Chapter I. The researchers viewed the first research objective (to identify the offsetting costs associated with component breakout) as a baseline for attaining the second research objective (to assess the importance of each offsetting cost in making component breakout decisions).

Included in this chapter is a description of the problem solving process developed and used by the researchers to accomplish the research objectives and answer the research questions. Key areas described are the nature and sources of data, the data collection processes, and the data analysis techniques. Next, the assumptions and limitations pertaining to the research methodology are listed. Finally, a brief summary of the research methodology is given.

## The Process

Figure 3 is a flowchart of the methodology developed for this research effort. The research methodology was developed as a step-by-step process which leads to attaining the research objectives. The elements of the flowchart illustrate the individual steps of the process. Each step will be addressed separately in subsequent sections of this chapter.




* The numbers refer to "STEPS" in Methodolgy

Figure 3. Methodology Flow Chart.

Step 1

The research site, survey population and sampling plan used to accomplish Research Objective 1 (to identify the offsetting costs associated with component breakout) were identified. As stated in Chapter I, AFSC's Aeronautical Systems Division (ASD) located at Wright-Patterson AFB, Ohio was chosen as the research site because approximately sixty percent of the weapon systems or major end item components

selected for breakout in AFSC come from this division. In addition, ASD is located at the same site as the research team. This allowed the researchers to collect the data within the time constraints of the thesis completion date.

The survey population consisted of the total number of items currently broken out and furnished as government furnished equipment within ASD. Each System Program Office (SPO) in ASD was contacted by the researchers to obtain the total number of items broken out in their program. A total of twenty-one components are currently broken out in ASD and provided to the prime contractor as GFE. A review was conducted of the file documentation maintained by the SPO's for nineteen of the twenty-one items. File documentation for two breakout decisions was not available for review because the contract files were physically located at another military installation. Appendix B shows the number of components identified for review in each SPO.

The researchers contacted the individual SPO's and made arrangements to review the contract file documentation of the breakout decision maintained for each breakout item. The intent of the review was to identify the offsetting costs that were considered in each breakout decision. The findings of the documentation review were recorded on a data collection record shown in Appendix C. A separate collection record was used for each breakout item.

Using the data recorded on the data collection record, a consolidated list of offsetting cost elements identified for

the nineteen items was developed. In cases where the terminology for like cost elements varied, a common term representative of the cost elements was chosen for the consolidated list.

Next, a tally was made of the number of times each offsetting cost was identified in the nineteen breakout decisions. A rank was also assigned to each offsetting cost based on the total number of times the cost was identified for a breakout decision. A rank of "one" was given to the offsetting cost considered most frequently. By ranking the offsetting costs based on frequency of occurrence, the offsetting costs used most often for breakout decisions were identified.

Step 2

In order to answer Research Question 1, a composite list of cost elements applicable to estimating the offsetting costs associated with component breakout must be identified. The researchers conducted a literature search to ensure the most comprehensive list of offsetting costs would be developed. Listed in Appendix D are the sources of literature which specifically addressed offsetting costs, along with the cost elements identified by each source. The cost elements identified in the literature were added to the original list of cost elements identified in the documentation review to form a composite list of offsetting costs affecting component breakout decisions.

Step 3

Noting the similarities of numerous cost elements identified in both reviews, the researchers chose to group similar cost elements into general cost categories. By categorizing similar cost elements, the researchers were able to derive a manageable composite list of offsetting costs associated with component breakout.

Next, personal interviews were conducted with a select group of professors from the Air Force Institute of Technology (AFIT) and component breakout managers at ASD. Although the professors from AFIT were not part of the population of practicing component breakout experts, they were familiar with component breakout policies and procedures. A listing of the interviewees is provided in Appendix E.

Each interviewee was provided with the composite list of offsetting costs. Comments were solicited regarding the comprehensiveness of the list of cost elements, and the clarity of terms chosen for each general cost category. The suggestions given by the interviewees were considered for inclusion in the composite list of offsetting costs associated with component breakout.

Step 4

With the development of a composite list of offsetting costs, the researchers directed their efforts toward accomplishing Research Objective 2 (to assess the importance of

each offsetting cost to a component breakout decision). The researchers first defined the research site, survey population and sampling plan to be used for data collection. The Aeronautical Systems Division was again used as the research site. In addition to the reasons stated in Step 1, a common frame of reference was established for comparative analysis purposes.

The survey population consisted of civilian and military personnel from ASD who have participated in at least one component breakout decision process. The researchers contacted senior management in each ASD System Program Office to obtain the number of component breakout experts in their organization. A total number of component breakout experts in ASD were identified by adding the number of component breakout experts in each SPO. The population of component breakout experts consists of approximately twenty-one individuals. The entire survey population of experts was included in the sampling plan.

The researchers conducted "structured" interviews with the twenty-one component breakout experts. Each expert was contacted by telephone and arrangements were made for the interview. The sole purpose of the interview was to administer a questionnaire. There was no spontaneous exchange of ideas between the interviewer and the respondent during the interview.

The questionnaire administered to the experts sought individual rankings of offsetting costs based on importance to

the breakout decision. The questionnaire incorporated the composite list of offsetting costs developed in Step 3. The offsetting costs were placed in alphabetical order on the questionnaire. The instructions directed the respondents to rank order the cost elements in order of importance using the definition of "importance" provided on the questionnaire. The most important offsetting cost was given a rank of one and the least important cost element a rank of fourteen. The questionnaire and accompanying instructions are provided in Appendix F.

Step 5

After completion of the structured interviews, the researchers performed a test of the data to determine if the rankings given to the offsetting costs by the experts were the same. The technique used for this test was Kendall's coefficient of concordance, W. Kendall's test of concordance is a technique designed to "measure the association between a fixed number of rankings from any number of respondents [20: 239]." The coefficient of concordance is "an index of the divergence of the actual agreement shown in the data from the maximum possible (perfect) agreement [20:230]." When using Kendall's coefficient of concordance, W, the null hypothesis ($H_o$) is: the rankings of the items by the respondents are unrelated. The alternative hypothesis ($H_a$) is: the rankings of the items by the respondents are related.

In performing Kendall's test of concordance, the

following steps were taken:

1. The null ($H_o$) and alternate ($H_a$) hypothesis were established:

$H_o$ : the rankings given to the offsetting costs associated with component breakout by the sample of experts are not related.

$H_a$ : the rankings of the offsetting costs given by the experts are related.

2. To evaluate the test, an alpha value of .05 was used. This alpha value is the probability of rejecting the null hypothesis as false when the null hypothesis is actually true (17:285).

3. The rank order scores were placed in a table. The judges (experts for this thesis) were placed along the left hand column and the offsetting costs were placed along the top row. The individual rankings were summed for each offsetting cost and a rank was assigned to each offsetting cost. The degree of agreement among the experts was reflected by the degree of variance among the sums of the ranks.

4. The Kendall's coefficient of concordance, W, was calculated using the following equation (20:237).

$$W = \frac{s}{(1/12)\ (k \times k)\ (N^3 - N)}$$

where

s = sum of the squares of the observed deviations from the means of the SUMS

$$s = \sum \left( R_j - \frac{\sum R_j}{N} \right)^2$$

$R_j$ = rank of the jth cost element

N = number of cost elements ranked

k = number of "experts" interviewed

5. If N is greater than 7, it can be stated that the test statistic W follows a Chi-Square distribution with N-1 degrees of freedom (29:236). The chi-square value for the ranks was calculated using the following formula:

$$\text{Chi Square} = k(N-1)W$$

where

k = number of experts

N = number of cost elements ranked

W = Kendall coefficient of concordance calculated in step 4

6. The chi-square value calculated in step 5 was compared against the critical value of 22.3621 with 13 (N-1) degrees of freedom shown in the Chi-Square table in Appendix G. If the chi-square value is less than the critical value, then the null hypothesis cannot be rejected. If the chi-square value is greater than the critical value, the null hypothesis can be rejected (20:237).

For this research project, the Kendall's test of concordance addressed the question of whether there was agreement among the experts on the importance of each offsetting cost to a component breakout decision. Since the test showed that the null hypothesis of no agreement in the rankings could be rejected with a 95 percent confidence level, the conclusion was that the experts agree on the importance of each offsetting cost to a breakout decision.

## Assumptions

1. The experts selected by their organizations were chosen for their experience in component breakout.

2. The sample of experts were representative of Air Force component breakout experts.

3. Anonymity was maintained by all respondents during the data collection phases.

4. Any cost elements omitted in the study had no significant impact on the research results.

5. The ordered responses supplied by the respondents reflect the actual order of importance of the cost elements that should be used to make component breakout decisions.

6. The respondents interpreted the terms and definitions of individual cost elements in the same manner.

7. The selected measurement instruments were appropriate for the type and nature of the data obtained.

## Limitations

1. This research project was limited by the time and resources available for research.

2. Some component breakout experts who developed prior offsetting cost estimates for component breakout decisions were no longer available for interview.

3. Not all offsetting costs used in prior component breakout decisions were documented.

## Summary of Methodology

This chapter describes the methodology developed by the researchers to accomplish the research objectives. The methodology was presented as a step-by-step problem solving

process. The process identifies sources of data, methods of data collection and techniques of data analysis.

The Aeronautical Systems Division was selected as the research site, with the populations identified as the number of component breakout efforts and the number of component breakout experts in the division. The entire population for both groups were surveyed.

Data collection consisted of identifying the offsetting costs that have been used in previous component breakout efforts. In addition, cost elements were identified through a search of literature on component breakout. The result of this effort was a composite list of the offsetting costs associated with component breakout.

Structured interviews were held with component breakout experts. A questionnaire (incorporating the composite list of offsetting costs) was administered to the experts to identify the importance of each offsetting cost to a component breakout decision. The researchers then performed a test to determine the agreement in the rankings given by the experts. Kendall's coefficient of concordance, W, was used for this test.

Using the methodology outlined in this chapter, the researchers will present the research findings in Chapter IV.

# IV. Research Findings

## Overview

The purpose of this chapter is to present the research findings resulting from the data collected by the researchers utilizing the research methodology formulated in Chapter III. This chapter consists of two main sections. Each section corresponds to one of the two research phases identified in Chapter I. Each phase is further subdivided into the problem solving steps designed to answer a specific research question. The answers obtained during data collection for the two research phases are presented in this chapter as primary findings. Corollary findings uncovered during data collection are also presented in this chapter.

## Research Phase I

Research Phase I was designed to answer Research Question 1: What offsetting costs are associated with component breakout?

### Step 1

First Primary Finding. Within ASD's System Program Offices a total of twenty-one components are currently broken out and provided to the prime contractor as GFE. A review was conducted of the file documentation maintained by the SPO's for nineteen of the twenty-one items. File documentation for two breakout decisions was not available for review because the contract files were physically located at another military

installation.

The offsetting cost elements identified for each of the nineteen breakout decisions were recorded on separate data collection records (see Appendix C). Table I is a consolidation of the data recorded on the individual data collection records. A total of thirty-four offsetting cost elements were identified in the review of component breakout file documentation. Because the terms used to describe "like" cost elements varied within the SPO's and between the SPO's, it was necessary to select a common term representative of the "like" cost elements. Table I incorporates the use of representative terms for "like" cost elements.

In order to derive a manageable number of cost elements, the similar costs identified in Table I were grouped into eleven general cost categories. The eleven categories are listed at the top of Table II. Also shown in Table II is a tally of the number of times each offsetting cost (by category) was identified in the nineteen breakout decisions. The two summary rows at the bottom of the table show the total number of times each offsetting cost was identified and the rank assigned to the cost. The rank given to each offsetting cost was based on the total number of times the cost was identified for a breakout decision. A rank of "one" was assigned to the offsetting cost identified most frequently.

TABLE I

Offsetting Cost Elements
Currently Identified in Component Breakout Decisions

1. acquisition management
2. configuration management
3. GFP management
4. interface management
5. production management
6. manpower
7. DCASMA support
8. contract administration support (AFPRO, NAVPRO)
9. DCAA review
10. logisitics support
11. technical support
12. reviews (MM/PCR, PAS, PMR, PRR, MEA)
13. TDY for reviews
14. reprocurement costs (RFP, pricing, clerical, source selection, committee reviews, legal reviews, management briefings)
15. integration data
16. reprocurement data (acquisition data)
17. support equipment
18. special test equipment
19. special tooling
20. inspection (QA)
21. additional CDRs
22. defective GFP
23. warranties
24. deliveries
25. late deliveries
26. storage
27. Government facilities
28. out-of-station costs
29. partial termination of prime contractor
30. socio-economic clause requirements
31. EEO clearance
32. continued prime-subcontractor interface
33. associate contractor relationship
34. security

## TABLE II

Rankings of Offsetting Costs by Frequency of Use
Obtained from File Documentation on Component Breakout

Cost Categories:

1. Contract Administration & Audit Personnel
2. Data
3. Equipment & Tooling
4. Manpower
5. Out-of-Station Costs
6. Reprocurement
7. Special Air Force Requirements
8. Storage
9. Technical Reviews
10. Continued Interface
11. Government Facilities

| | Cost Category | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Decisions | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | x | x | | x | | | x | | x | x | x |
| 2 | x | x | x | x | | | x | | x | x | x |
| 3 | x | x | x | x | | | x | x | x | x | x |
| 4 | x | x | x | x | | | x | x | x | x | x |
| 5 | x | x | x | x | | | x | | | x | |
| 6 | x | x | x | x | | | x | | | x | |
| 7 | x | x | x | x | | | x | | | x | |
| 8 | x | x | x | x | x | x | x | | x | x | |
| 9 | x | | x | x | | x | x | | x | x | |
| 10 | x | x | x | x | | | | | | | |
| 11 | | x | | x | | x | x | | | | |
| 12 | x | | x | x | | | x | | x | x | |
| 13 | x | | x | x | | | x | | x | x | |
| 14 | x | x | | x | | | | | | x | |
| 15 | x | x | | x | x | | x | | x | x | |
| 16 | x | x | x | x | | | x | x | x | x | |
| 17 | x | x | | x | | | x | | x | x | |
| 18 | x | x | | x | | | x | | x | x | |
| 19 | x | x | x | x | | | x | x | x | x | |
| TOTAL | 18 | 17 | 13 | 19 | 2 | 4 | 17 | 4 | 13 | 17 | 4 |
| RANK | 2 | 3 | 4 | 1 | 6 | 5 | 3 | 5 | 4 | 3 | 5 |

As shown in Table II, manpower was cited most frequently as an offsetting cost in a breakout decision. In all nineteen breakout decisions, manpower was identified as an offsetting cost. Manpower costs, often referred to as "management costs", consist of costs directly associated with all the individuals that comprise the component breakout team.

The next most frequently cited offsetting cost was contract administration and audit personnel. This cost was identified in eighteen of the nineteen breakout decisions. Data, special Air Force requirements and continued interface tied for the third most frequently cited offsetting cost. These three costs were identified in seventeen of nineteen breakout decisions.

Step 2

Second Primary Finding. In order to answer Research Question 1, a composite list of offsetting costs associated with component breakout must be identified. A review was conducted of existing literature on component breakout. During this review, the researchers found the list of offsetting costs used in previous breakout decisions was not inclusive of all the offsetting costs associated with component breakout.

Listed in Appendix D are the sources of literature which specifically addressed offsetting costs, along with the cost elements identified by each source. Terms such as "hidden

costs" and "management costs" are often used to identify offsetting costs. The additional offsetting cost identified in the literature, when added to the original list of offsetting costs found in Table I, form a composite list of offsetting costs affecting component breakout.

Step 3

Noting the similarities of numerous cost elements in Table I and Appendix D, the researchers chose to group the similar cost elements into fourteen general cost categories in order to derive a manageable "composite" list of offsetting costs. The fourteen offsetting cost categories that form the composite list of offsetting costs associated with component breakout are shown in Table III. (See Appendix F, Information Sheet for specific cost elements that make up each of the fourteen cost categories).

TABLE III

Composite List of Offsetting Costs (by Category)

1. Administrative and Audit Personnel
2. Air Force General and Administrative Expenses
3. Air Force Overhead Expenses
4. Data
5. Equipment/Tooling
6. Manpower (for component breakout team)
7. Out-of-station Production Costs
8. Reprocurement Costs
9. Security
10. Special Air Force Requirements
11. Storage
12. Technical Reviews
13. Partial Termination of Prime Contractor
14. Transportation/Distribution

## Corollary Findings for Research Question 1

In order to answer Research Question 1, the initial data collection was directed to identifying the offsetting costs associated with component breakout. However, additional findings were uncovered during the review of file documention maintained by the SPO's on component breakout decisions. The next section of this chapter will address the corollary findings that were found during data collection to answer Research Question 1. The researchers feel the corollary findings provide insight into the current practices of component breakout in the Air Force as well as lend support for the research conclusions.

First Corollary Finding. The number of offsetting costs considered for a breakout decision varied from contract to contract. Additionally, some of the offsetting costs identified were unique to an individual program. One contract file also documented that many of the acquisition cost impacts were unknown at the time a breakout decision was made. However, despite the variance in number and kind of offsetting costs used in a breakout decision, the researchers found that five of the categories of offsetting cost were used seventeen or more times, and four cost categories were used four or less times.

Second Corollary Finding. Component breakout has been viewed as a method of increasing competition in the acquisition of major weapon systems. However, fifteen of the

nineteen breakout items were obtained directly from the subcontractor through sole source procurements. The justifications for sole source indicated that reprocurement data was inadequate or unavailable, and/or insufficient time was available to compete the item and still be able to meet the current schedule for the entire weapon system.

Third Corollary Finding. During the review of file documentation on component breakout decisions, the researchers found that numerous offsetting costs were considered when making a breakout decision. However, actual calculations of offsetting costs were not documented in the contract files. In addition, estimates of the net cost savings (in dollars) of the breakout decision were not stated.

## Research Phase II

Research Phase II was designed to answer Research Question 2: What offsetting costs are most important to a component breakout decision?

### Step 4

First Primary Finding. A questionnaire was developed by the researchers incorporating the composite list of offsetting costs shown in Table III. The purpose of the questionnaire was to obtain individual rankings by component breakout experts of the importance of each offsetting cost to a breakout decision. The questionnaire and accompanying information sheet provided to each breakout expert are shown

in Appendix H.

The questionnaire was completed by twenty-one component breakout experts within ASD. The twenty-one experts were asked to individually rank order the list of offsetting costs assigning a one to the cost which was considered most important and a fourteen to the cost which was considered least important. The rankings obtained from the breakout experts are listed in Table IV.

Step 5

Second Primary Finding. To determine if there was agreement among the experts on the importance of each offsetting cost to making a component breakout decision, Kendall's coefficient of concordance, W, test was performed. Data used to perform the test was obtained from the expert rankings found in Table IV.

Kendall's Coefficient of Concordance, W, Test. The null hypothesis ($H_o$) established for Kendall's test of concordance is: the rankings given to the offsetting costs associated with component breakout by the sample of experts are not related. The alternate hypothesis ($H_a$) is: the rankings of the offsetting costs given by the experts are related.

The actual computations involved in the analysis are presented as follows:

W = Kendall's Coefficient of Concordance $0 < W < 1$

k = the number of "experts" interviewed [21]

N = the number of offsetting costs ranked [14]

TABLE IV

Component Breakout Expert
"Importance" Rankings of Offsetting Costs

| | Cost Categories (see Table III, page 46) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| Experts | | | | | | | | | | | | | | |
| 1 | 11 | 13 | 12 | 5 | 4 | 8 | 1 | 3 | 14 | 6 | 9 | 7 | 2 | 10 |
| 2 | 12 | 13 | 14 | 4 | 3 | 10 | 1 | 2 | 11 | 5 | 9 | 7 | 6 | 8 |
| 3 | 7 | 10 | 12 | 3 | 9 | 1 | 2 | 5 | 14 | 4 | 13 | 8 | 6 | 11 |
| 4 | 5 | 14 | 10 | 2 | 8 | 1 | 11 | 3 | 13 | 7 | 12 | 4 | 6 | 9 |
| 5 | 14 | 6 | 13 | 3 | 7 | 8 | 5 | 2 | 12 | 1 | 10 | 4 | 9 | 11 |
| 6 | 6 | 8 | 12 | 13 | 4 | 1 | 9 | 2 | 14 | 5 | 11 | 3 | 7 | 10 |
| 7 | 14 | 11 | 12 | 5 | 4 | 1 | 6 | 2 | 10 | 13 | 7 | 8 | 3 | 9 |
| 8 | 14 | 13 | 7 | 5 | 11 | 2 | 1 | 6 | 9 | 4 | 3 | 8 | 10 | 12 |
| 9 | 8 | 3 | 2 | 4 | 9 | 1 | 7 | 5 | 14 | 6 | 13 | 11 | 10 | 12 |
| 10 | 8 | 7 | 11 | 3 | 5 | 1 | 10 | 2 | 14 | 13 | 9 | 4 | 6 | 12 |
| 11 | 10 | 6 | 14 | 1 | 3 | 7 | 2 | 5 | 13 | 9 | 12 | 11 | 4 | 8 |
| 12 | 9 | 10 | 1 | 6 | 7 | 3 | 4 | 2 | 13 | 11 | 12 | 5 | 14 | 8 |
| 13 | 11 | 7 | 10 | 1 | 5 | 2 | 13 | 4 | 12 | 8 | 14 | 3 | 6 | 9 |
| 14 | 11 | 1 | 3 | 4 | 8 | 2 | 10 | 13 | 14 | 9 | 7 | 5 | 12 | 6 |
| 15 | 6 | 4 | 2 | 9 | 10 | 3 | 5 | 1 | 13 | 7 | 12 | 8 | 14 | 11 |
| 16 | 3 | 2 | 4 | 6 | 7 | 1 | 12 | 8 | 14 | 10 | 11 | 5 | 13 | 9 |
| 17 | 12 | 11 | 13 | 1 | 2 | 5 | 6 | 8 | 10 | 14 | 9 | 3 | 4 | 7 |
| 18 | 13 | 10 | 1 | 12 | 9 | 3 | 4 | 5 | 14 | 13 | 7 | 6 | 2 | 8 |
| 19 | 10 | 8 | 5 | 2 | 3 | 1 | 7 | 9 | 14 | 11 | 12 | 13 | 4 | 6 |
| 20 | 6 | 7 | 3 | 8 | 5 | 2 | 10 | 1 | 11 | 11 | 11 | 4 | 11 | 9 |
| 21 | 5 | 9 | 4 | 3 | 8 | 6 | 10 | 1 | 11 | 2 | 12 | 7 | 14 | 13 |
| SUMS | 195 | 173 | 165 | 100 | 131 | 69 | 136 | 89 | 264 | 169 | 215 | 134 | 163 | 198 |
| RANK | 11 | 10 | 8 | 3 | 4 | 1 | 6 | 2 | 14 | 9 | 13 | 5 | 7 | 12 |

MEAN SUM: 157.21

s = sum of the squares of the observed deviations from the means of the SUMS obtained from Table III.

$$s = \sum \left( R_j - \frac{\sum R_j}{N} \right)^2$$

$$\begin{aligned} s = \quad & (195-157.21)^2 + (173-157.21)^2 + (165-157.21)^2 + \\ & (100-157.21)^2 + (131-157.21)^2 + (69-157.21)^2 + \\ & (136-157.21)^2 + (89-157.21)^2 + (264-157.21)^2 + \\ & (169-157.21)^2 + (215-157.21)^2 + (134-157.21)^2 + \\ & (163-157.21)^2 + (198-157.21)^2 = 35,700.36 \end{aligned}$$

$$W = \frac{s}{(1/12)\ (k \times k)\ (N^3 - N)} = \frac{35700.36}{100287.36} = .35598$$

Since N is greater than 7, it could be stated that the test statistic W follows a Chi-Square distribution with N-1 degrees of freedom.

Chi-Square Value = (k) (N-1) (W) = 21(13).35598 = 97.18

The test chi-square value at $\alpha$ = .05 level of significance based on 13 (N-1) degrees of freedom = 22.3621 (refer to Appendix G for abbreviated Chi-Square table).

Since the actual chi-square value of 97.18 exceeds the test value of 22.3621, the null hypothesis was rejected. Thus, the surveyed experts agreed on the importance of each offsetting cost to a breakout decision.

## Summary of Primary Findings for Research Question 2

Table V provides a summary of the rankings obtained from the structured interviews with the component breakout experts. The rankings are based on the sums in Table IV, with the offsetting cost having the lowest sum ranked the highest. The offsetting cost ranked number one signifies the most important offsetting cost. Importance was defined by the researchers as "the impact an offsetting cost has on the projected net cost savings of the breakout effort."

TABLE V

Summary of Expert "Importance" Rankings

| Rank | Offsetting Costs |
|---|---|
| 1 | Manpower (for component breakout team) |
| 2 | Reprocurement Costs |
| 3 | Data |
| 4 | Equipment/Tooling |
| 5 | Technical Reviews |
| 6 | Out-of-Station Costs |
| 7 | Partial Termination of Prime Contractor |
| 8 | Air Force Overhead |
| 9 | Special Air Force Requirements |
| 10 | Air Force General & Administrative (G & A) |
| 11 | Contract Administrative and Audit Personnel |
| 12 | Transportation/Distribution |
| 13 | Storage |
| 14 | Security |

As shown in Table V, the offsetting cost ranked the highest in importance was manpower. Appearing second and third in importance were reprocurement costs and data.

Using the information provided in Table IV, the reseachers performed Kendall's coefficient of concordance, W, test to determine the agreement among the experts on the

importance of each offsetting cost to a breakout decision. The results of Kendall's test of concordance indicate that the twenty-one ASD component breakout experts agree on the relative importance of each offsetting cost to a breakout decision.

Corollary Findings for Research Question 2

This research effort was undertaken to collect, analyze and interpret data to identify the offsetting costs associated with component breakout, and to assess the importance of each offsetting cost to a breakout decision. In the preceding sections of this chapter, the primary findings for Research Question 1 and 2 as well as corollary findings for Research Question 1 were presented. The next section of this chapter will provide the corollary findings that surfaced during data collection to answer Research Question 2. The primary findings provided the answers to Research Question 2. However, the researchers believe that the corollary findings provide additional support for the research conclusions.

First Corollary Finding. A comment section was provided on the questionnaire administered to the component breakout experts. Nine comments were received regarding the importance of offsetting costs. The comment received most frequently was that the importance of each offsetting cost can vary from one breakout situation to another. Reasons cited for the variance in importance of offsetting costs were "the amount of manpower required is dependent on the complexity of the item considered

for breakout" and "the amount and type of data available at the time an item is considered for breakout will impact the total cost of the breakout situation."

A comment was made that the importance of an individual offsetting cost can also change after a breakout decision has been made, citing out-of-station costs as an example -- "If the breakout decision accurately reflects the status of the equipment and supplies, no offsetting costs will be incurred. However, if there are problems that are not adequately understood or predicted when the breakout decision is made, then out-of-station costs could equal or exceed any projected savings."

A third comment received by the experts was that the overall importance of cost can take second place to other factors such as risk, procurement leadtimes, and political pressures.

Second Corollary Finding. Table VI provides a summary of the two sets of rankings discussed earlier in this chapter (See Tables II, III, and IV). As shown in the table, continued interface and government facilities were identified as cost categories for the frequency of use rankings, but not for the frequency of importance rankings. On the other hand, Air Force G & A, Air Force overhead, partial termination of prime contractor, transportation/distribution, and security were identified as cost categories for the frequency of importance rankings, but not for the frequency of use rankings.

TABLE VI

Summary Table of Rankings

| | Cost Category | Ranks for Frequency of Use | Ranks for Frequency of Importance |
|---|---|---|---|
| 1. | Contract Administration Audit Personnel | 2 | 11 |
| 2. | Air Force G & A | * | 10 |
| 3. | Air Force Overhead | * | 8 |
| 4. | Continued Interface | 3 | * |
| 5. | Data | 3 | 3 |
| 6. | Equipment/Tooling | 4 | 4 |
| 7. | Government Facilities | 5 | * |
| 8. | Manpower | 1 | 1 |
| 9. | Out-of-Station Costs | 6 | 6 |
| 10. | Reprocurement Costs | 5 | 2 |
| 11. | Partial Termination of Prime Contractor | * | 7 |
| 12. | Security | * | 14 |
| 13. | Special Air Force Requirements | 3 | 9 |
| 14. | Storage | 5 | 13 |
| 15. | Technical Reviews | 4 | 5 |
| 16. | Transportation/ Distribution | * | 12 |

Note: the asterisks (*) in each column represent the cost categories not used in the ranking process for that set.

In most cases, two ranks are shown in Table VI for each offsetting cost, one for frequency of use in previous component breakout decisions and one for frequency of importance to a breakout decision as judged by the experts. When comparing the two ranks for each offsetting cost, the researchers observed a notable variance in the ranks for the

contract administration and audit personnel cost category. The cost was identified in eighteen of nineteen contract files (ranked second for frequency of use), but was only ranked eleventh in importance.

Finally, as shown in Table VI, reprocurement costs were ranked second in importance, yet the second corollary finding for Research Question 1 identified that fifteen of the nineteen breakout decisions were awarded directly to the subcontractor as sole source procurements.

Third Corollary Finding. The top rankings of cost categories for each ranking set are given in Table VII. As shown in the table, the individual ranks of several cost categories were very similar for both ranking sets. Manpower

TABLE VII

Top Rankings of Offsetting Costs

| Rank | Frequency of Use | Frequency of Importance |
|---|---|---|
| 1 | Manpower | Manpower |
| 2 | Contract Administration & Audit Personnel | Reprocurement Costs |
| 3 | Data, Air Force Requirements, Continued Interface (tied) | Data |
| 4 | Equipment/Tooling, Technical Reviews (tied) | Equipment/Tooling |
| 5 | Reprocurement Costs, Storage, Government Facilities (tied) | Technical Reviews |

was ranked number one for frequency of use and frequency of importance. Data was ranked number three, and equipment/ tooling was ranked number four for both sets of rankings. Finally, technical reviews were ranked number four in use and number five in importance.

Selected Expert Comments on Corollary Findings

The corollary findings that surfaced during data collection and data analysis for Research Question 2, as well as Research Question 1, provided new and interesting information about component breakout offsetting costs. However, five of the findings spawned further questions in the minds of the researchers. In order to settle these questions and to gain a better understanding of each finding, the researchers held discussions by telephone with eight component breakout experts. The five specific findings discussed with the experts are stated below, followed by selected comments given by the experts.

1. The contract administration and audit personnel cost category was identified as an offsetting cost in eighteen of nineteen breakout decisions, but was ranked eleventh (of fourteen) in importance. Why?

a. These costs are sunk costs; they are already established. They have no direct effect on the cost of the breakout action.

b. These costs would occur anyway. The increased dollars are not percieved in the SPO. The same follow-up jobs occur either way.

c. These costs are negligible. They are such a small part of the overall cost structure.

d. Audit and contract administration are support functions. The same functions are performed regardless of component breakout; the costs occur anyway.

2. Reprocurement costs were ranked number two in importance, yet fifteen of the nineteen breakout items were sole source procurements. Why are reprocurement costs considered so important?

a. Reprocurement costs utilize direct resources and manpower from the SPO and must be allocated to accomplish the procurement.

b. It depends on the procurement; if reprocurement is required, costs would be high.

c. The time spent even on a sole source procurement is spread throughout the SPO and component breakout receives high visibility.

3. Fifteen of the nineteen breakout items were sole source procurements, yet component breakout is heralded as a means of increasing competition. Why are so many of the breakout efforts awarded as sole source procurements?

a. Part of the problem is the inadequacy of data packages. We may not have the lead time on the initial lot.

b. Proprietary data hold us back; it is not a real reprocurement package. Subcontractors do not want competition and prime contractors do not want to lose the profit.

c. By the time component breakout takes place, we are already in the provisioning phase and we do not

want to take the risk.

d. Component breakout does not really foster competition. The cost of data is too high to really be able to compete.

e. The SPO wants to stick with a reliable and proven producer to keep the risk low.

4. As identified in the literature, Air Force overhead and G & A are acceptable costs to the government. However, none of the nineteen breakout decisions recognized Air Force overhead and G & A as offsetting costs to a breakout decision. Why?

a. These costs should be and are recognized, but the cost is minimal.

b. G & A and overhead are not costs to the program per se, but rather a cost to the Air Force as a whole.

c. Overhead costs do not come out of SPO dollars; they are not a direct cost to the program office.

d. G & A and overhead are recognized as a cost, but rarely is the SPO required to estimate its own costs in terms of overhead and G & A.

5. No specific dollar estimates of offsetting costs were found in any of the nineteen contract files reviewed. Yet, DAR/DOD Supplement to the FAR state that each breakout decision must embrace a calculation of estimated net cost savings and must be supported by adequate explanatory information. The experts were asked to comment on the lack of contract file documentation showing dollar estimates of the offsetting costs.

a. The program decision to breakout a component is often made irrespective of offsetting costs.

b. Analysis of component breakout decisions are often made after the fact, rather than before.

c. Many of the offsetting costs have a ripple effect and are difficult to estimate.

d. Component breakout is stressed so hard. It is directed to be done, so it is, regardless of the offsetting costs.

e. Most offsetting costs are difficult to estimate, much less come up with any specific dollar value estimate. Also, there is some uncertainty of the cost impact at the outset of the breakout action.

f. Offsetting costs are difficult to quantify. Consideration is given to offsetting costs, but we don't sit down and precisely figure out the dollar value costs.

## Conclusion

Chapter IV has taken the reader through the steps of the problem solving methodology developed in Chapter III to answer the two research questions. The primary and corollary findings resulting from the collection, interpretation and analysis of data have been stated for each research question. The chapter concludes with a summary of comments made by component breakout experts concerning specific corollary findings that surfaced during data collection and analysis. In the final chapter, the researcher summarize the results of the research effort, present conclusions drawn from the research findings presented in this chapter, and make recommendations for future research in the area of offsetting costs and component breakout.

# V. Summary, Conclusions, and Recommendations

## Overview

This research effort was undertaken to identify the offsetting costs associated with component breakout and to assess the importance of each offsetting cost to a breakout decision. To accomplish this task, the researchers developed a general research plan consisting of two phases. The first phase corresponds with the first research objective: to identify a composite list of offsetting costs associated with component breakout. The second phase corresponds to the second research objective: to assess the importance of each offsetting cost to a breakout decision.

The purpose of this chapter is to provide a summary of the results of the researchers' efforts to accomplish the research objectives, to draw conclusions about the research findings, and to present recommendations for future research. Specifically, the two research objectives form the main sections of this chapter. A summary of the primary research findings will be presented for each research objective, followed by the researchers' conclusions about the research findings. Next, the researchers will draw conclusions about the corollary findings set forth in Chapter IV. Finally, recommendations for future research in the area of offsetting costs and component breakout will be presented.

## Research Objective 1

Primary Findings. Three steps were used by the

researchers to achieve the first research objective (See Chapter III, Steps 1 through 3). First, a review was conducted of the file documentation maintained for nineteen items currently broken out in ASD. Thirty-four offsetting cost elements were identified in the review. Next, a thorough literature review was conducted. The four sources of literature specifically addressing offsetting costs identified three additional offsetting costs associated with component breakout.

The combined list of offsetting cost elements resulting from the two reviews provided the researhers with a composite list of offsetting cost elements. However, the researchers observed similarities among numerous cost elements. This observation led the researchers to group the similar cost elements into general cost categories in order to form a manageable list of offsetting costs. Fourteen categories make up the final composite list of offsetting costs (See Table III and/or Appendix F, Information Sheet).

Conclusions for Primary Findings. An extensive list of offsetting costs associated with component breakout resulted from the two separate reviews conducted by the researchers. It is always possible to find "just one more" offsetting cost by expanding the depth and breadth of review. However, the two reviews provided both a theoretical and practical view of the offsetting costs associated with component breakout. In addition, by placing the offsetting costs into general cost

categories, a generic list of offsetting costs was developed and any other cost elements identified would more than likely fit into one of the general cost categories.

The researchers are aware that a specific cost element may be applicable to more than one cost category, and that the cost categories themselves may overlap. However, the researchers feel the generic list of offsetting costs they have developed is inclusive of all the important offsetting costs associated with component breakout. While the researchers postulate their list of offsetting costs as comprehensive, the researchers also remind component breakout decision-makers to look at the "specifics" of each individual breakout situation, and assess the offsetting costs accordingly. Each situation is unique.

Conclusions for Corollary Findings. This sub-section of the research study highlights the researchers' conclusions to the three corollary findings identified in Chapter IV for Research Objective 1. The corollary conclusions are the researchers' interpretations of the findings that surfaced during data collection.

First Corollary Finding. The researchers found that five of the categories of offsetting costs were assessed in seventeen of the nineteen breakout decisions made in ASD. This finding indicates that almost half of all offsetting costs identified were used in ninety percent of the breakout decisions, suggesting that perhaps some offsetting costs may

be more important than others to a breakout decision.

While some offsetting costs may be used more often when making a breakout decision, or may be more important than other offsetting costs, the researchers also found that the number of offsetting costs considered in a breakout decision varied from one situation to another. This finding suggests that it is not the number of offsetting costs used in a breakout decision that is important, but that the number of offsetting costs considered in a breakout decision is situational dependant. This may mean that only three offsetting costs will be considered in one breakout decision, while as many as eleven offsetting costs should be considered in another breakout decision.

Second Corollary Finding. The second corollary finding identified a lack of file documentation showing actual calculations of offsetting cost estimates. The researchers attribute this finding to the lack of guidance available to the component breakout decision-maker to establish an estimate of the offsetting costs of component breakout and, in turn, an estimate of net cost savings. This finding also provides further support for the findings of four previous research studies (SIS80, AFAA80, COHEN80, and APRO84) discussed in Chapter I. These four studies indicated a need for further guidance in developing estimates of cost savings of component breakout, suggesting the first step entail an identification of the types of costs expected to be incurred in a CFE/GFE

decision.

This research effort was undertaken to identify the offsetting costs that take away from the potential savings of component breakout and to the assess the importance of each offsetting cost to a breakout decision. A composite list of offsetting costs associated with component breakout has been identified by the researchers. The next step is to identify the type of each offsetting cost (whether the cost is subjective or objective) and, where appropriate, develop estimating techniques that will provide more accurate estimates of each offsetting cost. This will help achieve a more accurate estimate of the overall cost savings of component breakout.

Component breakout is a special method of contracting that can lead to significant life cyle cost savings; however, the method used to calculate the cost savings potential of component breakout will determine the "real" savings of component breakout. The simplistic method of subtracting the prime contractor's middle-man costs to determine the cost savings of component breakout does not take into account the "hidden" costs of managing GFE, the increased support and administrative costs, and the costs associated with resolving potential problems such as late deliveries. When making a breakout decision, the component breakout decision-maker should first identify the full range of offsetting costs affecting each individual breakout situation. The decision-maker should then assess each offsetting cost using a method

of analysis that accurately predicts its cost impact.

Third Corollary Finding. The researchers found that over seventy-five percent of the breakout actions at ASD were procured directly from the subcontractor through sole source procurements. Unavailability of reprocurement data and insufficient time to compete were cited most frequently as reasons for the sole source procurements.

This finding indicates that the Air Force is not obtaining the benefits of competition through component breakout that may be available to them. The researchers attribute this finding to a lack of early planning and detailed preparation on the part of the acquisition management team. In order for component breakout to become a means of increasing competition, program managers must begin planning for component breakout as soon as possible after the initial baseline of a weapons system is determined and should, at that time, begin looking for other potential sources of supply. Implementing component breakout in a weapons acquisition program is not an easy task, and adding the issue of competition complicates the task even more.

## Research Objective 2

Primary Findings. The researchers' second research objective was to determine the importance of each offsetting cost identified in Research Phase I. The researchers used a two step process (See Chapter III, Steps 4 and 5) to achieve this objective.

First, a questionnaire was written by the researchers incorporating the final composite list of offsetting costs developed in the first research phase. The questionnaire was administered to twenty-one component breakout experts from ASD. The experts were asked to assess the importance of each offsetting cost to a breakout decision. Using the ranking results obtained from the questionnaire, the researchers performed Kendall's test of concordance to determine the agreement among the experts on the importance of each offsetting cost. The results of Kendall's test of concordance indicates there is agreement among the experts on the relative importance of each offsetting cost. Manpower was ranked the most important offsetting cost to impact a breakout decision, followed by reprocurement costs and data.

Conclusions for Primary Findings. The researchers recognize that any one offsetting cost can vary in importance from one breakout situation to another. Additionally, personal bias or experience can influence the importance rankings given by each expert. However, the researchers feel the composite list of important offsetting costs does provide a starting point for addressing the costs that offset the potential savings of component breakout.

The importance of manpower, as well as any of the other costs that offset the potential savings of component breakout, cannot be overlooked. However, acknowledging the importance of offsetting costs is not enough. An analysis of each off-

setting cost should also be performed in order to predict the impact a particular cost has on the projected cost savings of the breakout effort. This requires specific methodologies designed to accurately forecast and evaluate each offsetting cost. Although previous research on component breakout has been performed, reliable guidelines have not yet been developed to accurately assess individual offsetting costs. Lacking such methodologies, the component breakout decision-makers are unable to effectively estimate the potential savings of a breakout effort. Furthermore, without knowing how to evaluate an item for breakout, component breakout decision-makers have focused on the degree to which component breakout is or is not applied, rather than how much it will or will not help to reduce the overall cost of the major weapon system.

Conclusions for Corollary Findings. Three corollary findings were identified in Chapter IV for Research Objective 2. This sub-section will provide the researchers' conclusions for each corollary finding. The conclusions are the researchers' interpretations of the corollary findings that surfaced during data collection.

First Corollary Finding. This corollary finding resulted from the comment section provided on the questionnaire administered to twenty-one component breakout experts. The most frequent comment was "the importance of an offsetting cost can vary from one breakout situation to another." This

comment was made most often by the experts to qualify their individual rankings of offsetting costs. The researchers recognize that the overall importance of cost as well as the importance of each offsetting cost can vary from one situation to another. However, the researchers view this concern as a positive indicator that the experts are aware of the importance of considering each breakout situation as unique and different. Additionally, the researchers are aware that the experts must make breakout decisions with less than perfect information; but if the breakout decision-makers assess the important offsetting costs at the time the breakout decision is made, the best possible breakout decisions will be made.

Second Corollary Finding. A comparison was made by the researchers of the rankings of offsetting costs used in previous breakout decisions with the rankings of offsetting costs considered important by component breakout experts. Air Force G & A, Air Force overhead, security and transportation/ distribution were identified on the composite list of important offsetting costs, but were not identified as offsetting costs in the review of component breakout file documentation. As identified in Chapter IV, component breakout experts view Air Force G & A and Air Force overhead as costs to the Air Force and not direct costs to the program office. The researchers are aware that methods have not been established for tracking or estimating these two types of costs. However, the researchers feel that these costs should

not be overlooked or set aside just because they are difficult to calculate or estimate. Likewise, transportation/distribution, and security are both offsetting costs that should be considered despite the fact that they are not ranked very high in importance. The more accurate the estimate is for each offsetting cost, the more accurate the estimate of cost savings for a breakout effort will be.

The contract administration and audit personnel cost category was identified in eighteen of nineteen contract files, but was only ranked eleventh in importance. As identified in Chapter IV, this offsetting cost is viewed by the experts as a "sunk" cost which does not have a direct effect on the cost of the breakout action. Another comment made by an expert was "several of the offsetting costs are in the noise level and do not really contribute to the cost of breakout." Whether a cost is direct or indirect, the researchers maintain their general feeling that each offsetting cost should be considered no matter how minimal the cost may be. Additionally, if several minimal costs are added together the impact could be considerably different.

Reprocurement costs were ranked second in importance, yet over fifteen of the nineteen breakout decisions were awarded directly to the subcontractors as sole source procurements. Why are reprocurement costs considered so important? The experts look at reprocurement costs as direct resources and manpower out of the SPO and must be allocated whether the procurement is sole source or competitive. The researchers

also view reprocurement costs as important no matter what the type of procurement is. If competition is not possible because adequate acquisition data is not available, the researchers suggest that a determination be made of the cost effectiveness of acquiring the needed acquisition data.

Third Corollary Finding. Four of the top five offsetting costs ranked most important by the experts were also used most frequently by the program offices at ASD when making a decision to break out a component. The researchers view this finding as an indication of the most "important" offsetting costs in a breakout situation. In most cases, these costs (manpower, data, equipment/tooling, and technical reviews) will perhaps be the most important offsetting costs and should be given primary consideration when making a breakout decision.

As noted in Chapter IV, manpower was identified as the most important offsetting cost by the experts and was identified most often in previous breakout decisions. This finding is consistent with the findings of a previous research study conducted by Cohen in 1980. In his efforts to examine and analyze the GFE/CFE decision-making process, Cohen conducted a broad range of interviews with acquisition personnel to identify the factors considered important when making a GFE/CFE decision. The most important decision factor cited by those interviewed was the availability of personnel resources to manage the acquisition of a component once it was

converted from CFE to GFE. Personnel resources were identified in Cohen's study as technical and administrative personnel, as well as support personnel assigned to field activities (2:58).

Component breakout decision-makers should be able to track and estimate manpower costs, as well as other offsetting costs with some degree of accuracy. An accurate estimate of offsetting costs associated with breaking out a specific component would, in turn, provide a more accurate estimate of the potential savings of a component breakout effort.

## Recommendations

As noted in the previous chapters, component breakout is viewed as a special contracting method that could lead to significant cost savings as well as increase the level of competition during the production phase of the major weapon system acquisition process. While offering potential cost savings to the Air Force, any component breakout effort must be approached with care and foresight. The difference between the success or failure of component breakout implementation during the production phase reflects in large measure the sense of purpose, clarity of overall objectives, early planning and detailed preparation the program manager devotes to the effort. There are deliberate actions that managers can take to significantly improve the success of component breakout implementation. One of these actions is to identify and assess the offsetting costs that can take away from the

potential savings of component breakout.

This research effort has proposed a composite list of offsetting costs considered important to a breakout decision. However, because each breakout situation is unique, this list should not be viewed as an all-encompassing list of offsetting costs important to a breakout decision, but rather a generic list of offsetting costs important to a breakout decision. This is only a beginning step to gaining a better understanding of the cost issue of component breakout. The next section of this chapter provides some recommendations that will help to either reduce or eliminate the existing problems associated with estimating the offsetting costs of component breakout and, in turn, estimating the potential cost savings of component breakout.

Develop Methods of Analysis. The offsetting costs identified in this research effort can be classified as subjective costs or objective costs, with each classification requiring a different form of analysis. However, no definitive guidance has been developed in the DOD or in the Air Force to assist the component breakout decision-makers in performing either quantitative or qualitative methods of analysis to determine the cost impact of individual offsetting costs. The researchers recommend that specific methods of analysis be developed for assessing each offsetting cost. This will then allow the component breakout decision-maker to arrive at a realistic and reliable estimate of the potential

savings of breaking out a component.

In the case where the estimate of savings is marginal, or when the savings are based on the difference between the prime contractor's price and the subcontractor's price and no consideration has been given to offsetting costs, it is even more important that an accurate estimate of savings is calculated. If the savings calculations are inaccurate, the Air Force could easily end up without any savings, and in some cases, increased costs.

Document Cost Savings Calculations. The researchers found minimal documentation of the estimated cost savings for the nineteen component breakout efforts in ASD. When instituting programs and techniques in the Air Force, care should be taken to avoid blind adherence to a program or technique without first trying to determine the cost-benefit relationship. The researchers recommend that when a system program office engages in component breakout, the full decision, including the methods and actual cost calculations, be documented in an effort to determine the value of the breakout effort. It is feasible to document a breakout decision, but the lack of specific guidance for assessing offsetting costs will complicate the documentation task. The documented cost data will provide evidence of the value and usefulness of component breakout.

Collection of Information and Expertise. At the present time there is no central repository of information or

expertise on how component breakout decisions are being made. The information can be obtained only by contacting each major system program office that has implemented breakout. With the turnover of personnel in the SPO organizations, some valuable information and experience is being lost. The researchers recommend that staff level organizations (i.e., ASD staff, AFSC staff) place more emphasis on lessons learned from previous breakout efforts. This can be done by designating an individual in the staff organization to collect information on lessons learned for dissemination to other SPO organizations upon request. By centralizing this responsibility, any SPO organization planning to implement component breakout in the future can utilize the expertise and assistance that will be available in the staff level organizations.

The kinds of information that would be useful to a component breakout decision-maker, but are not currently collected in any central or systematic way are:

1. The methods used to determine the offsetting costs as well as the cost savings of component breakout.

2. The degree of technical sophistication involved in the overall system, and the technical advance it represents.

3. The program environment, in terms of perceived risks, urgency of development and the number of competing firms involved.

4. The expected size of the production run.

5. The quality of the item obtained through breakout and

the reasons for any quality or other major shortfalls.

6. The decision-making process used to make a breakout decision.

How Should Component Breakout Function? The underlying theory of how component breakout should function in major weapon system acquisition appears to be inadequately developed. A question still unanswered is "In what circumstances does component breakout lead to cost reductions or profit reductions, or some combination of the two?" The researchers recommend that further research be conducted to develop and refine this element of theory. A greater understanding of this theory would be valuable if it could provide a framework to guide the collection of data and the design of data analysis techniques to accurately estimate the potential cost savings of component breakout.

Replication of this Study.

In an effort to establish greater confidence in the research results, replication of this study is recommended at other divisions (ESD, SD, AD) within Air Force Systems Command (AFSC), or for AFSC as a whole. The replication would identify if the same or similar offsetting costs are used in component breakout decisions and whether the rankings of importance are the same for the individual offsetting costs. Another researcher may also find a better way of categorizing the offsetting costs. This, in turn, may prove other costs to be more important than those identified in this study.

Increasing Competition Through Component Breakout. Component breakout is viewed as a means of increasing competition in the major weapon system acquisition process. However, during a review of component breakout file documentation the researchers found that fifteen of the nineteen items currently broken out in ASD were awarded directly to the subcontractor through sole source procurements. The researchers recommend that a study be conducted to assess the extent to which competition has been used when implementing component breakout, how it has been employed, what the circumstances were, what factors were involved in the decision and what the consequences of its use were. The results of such a study would provide program managers with a better understanding of the factors that inhibit the use of competition when implementing component breakout.

## Summary

The thrust of DOD's component breakout policy is to achieve substantial net cost savings over the life of the major weapon system acquisition process. However, an adequate set of tools for estimating both the costs and benefits of component breakout have not been developed. It is not enough simply to have faith that the breakout process will lower costs by some amount. An estimate of the costs associated with component breakout is needed in order to judge whether the savings will be sufficiently greater than the costs incurred by the breakout process. The starting point for developing an

estimate of the cost savings of component breakout is to identify the costs that offset the potential savings of component breakout. Once the offsetting costs have been identified, the next step is to evaluate each cost using a method of analysis that accurately predicts the impact of the particular cost.

This research effort proposes a composite list of offsetting costs associated with component breakout and provides an assessment of the relative importance of each offsetting cost to a breakout decision. The researchers view this development as the first essential step to establishing an accurate estimate of the potential cost savings of component breakout.

In addition, the findings of this research effort provide substantial justification for the need to further develop and refine the process of estimating the offsetting costs that impact a breakout decision. However, this is not a simple, nor easy task. Careful planning and detailed preparation are essential. To accomplish this task, the researchers provide the following recommendations:

1. Establish a central repository of component breakout information and expertise.

2. Fully document each breakout decision, including actual cost calculations.

3. Develop methodologies to forecast and evaluate each cost that offsets the potential savings of component breakout.

As with any decision-making situation, information is

rarely completely known when a breakout decision is to be made. However, there are sources of information that will increase the component breakout decision-makers confidence that the "best" breakout decision will be made. The recommendations provided above are three such sources of information. Specifically, these information sources will provide the decision-maker with the information needed to further develop and refine the process of estimating the offsetting costs that impact a breakout decision.

## Appendix A: Key Definitions

The following key terms used most frequently throughout this research are defined in order to form a common frame of reference:

1. component: subsystems, assemblies, subassemblies, or other major elements of a weapon system or other major end item (8:1-326.2; 9:17.7202-3).

2. component breakout: a special contracting method in which the Department of Defense purchases a weapon system or major end item component directly from the manufacturer or subcontractor, or through competitive procurement, and furnishes the component to the prime contractor as government furnished equipment for incorporation into the end item.

3. component breakout selection process: the decision process by which the Government determines which components of an end item will be purchased by the Government and provided to the prime contractor as government furnished equipment for incorporation into the end item, rather than provided by the prime contractor as contractor furnished equipment.

4. contractor furnished equipment (CFE): items acquired or manufactured directly by the contractor for use in the system or end item under contract (16:167-168).

5. cost analysis: an analytical process for estimating offsetting costs that is used to determine the potential net cost savings of component breakout.

6. end item: assembled whole system or final combination of end products, component parts and/or materials which are ready for intended use (21:254).

7. government furnished equipment (GFE): items in the possession of or acquired directly by the Government and subsequently delivered to or otherwise made available to the contractor for integration into the system or end item (16:321).

8. net cost savings: estimated purchase savings less any offsetting costs associated with breaking out a component (8:1-325.4; 9:17.7202-4).

9. offsetting costs: costs that take away from the potential cost savings of component breakout. Offsetting costs associated with component breakout include such costs as contract administration, data package purchase, material inspection, qualification or preproduction testing, ground support and test equipment, transportation, security, storage, distribution, and technical support (8:1-326.4; 9:17.7202-5).

10. prime contractor: an individual, company, firm or corporation which has entered into a contract with the Government to furnish an end item (16:538).

## Appendix B: Sampling Plan for Research Objective 1

The System Program Offices (SPO) in ASD that are currently involved with component breakout are listed below. Component breakout contract file documentation was reviewed for the number of components listed for each SPO. A total of nineteen files were reviewed.

| System Program Office | Number of Components Reviewed |
|---|---|
| B-1 | 5 |
| RW | 4 |
| TA | 3 |
| YP | 7 |
| Total | 19 |

## Appendix C: Data Collection Record

System Program Office _____

Brief description of the breakout item:

_____

_____

_____

Offsetting Costs:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

Other findings:

_____

_____

_____

AD-A147 017 IDENTIFICATION AND IMPORTANCE OF OFFSETTING COSTS IN COMPONENT BREAKOUT(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 2/2

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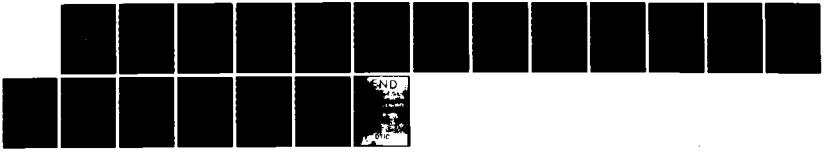

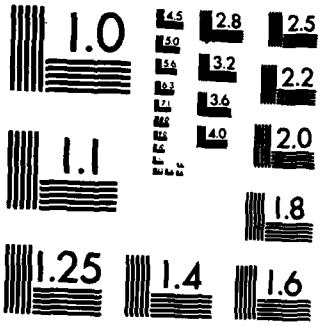
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1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0

## Appendix D: Offsetting Cost Elements Identified in a Literature Review on Component Breakout

Through a literature review, the researchers found that the list of offsetting costs identified in previous breakout decisions was not inclusive of all the offsetting costs associated with component breakout. Listed below are the sources of literature which address offsetting costs, along with the specific offsetting costs identified by each source.

A. DAR 1-326.4 and DOD FAR Supplement 17.7202-5.

1. requirements determination and control
2. contracting
3. contract administration
4. data package purchase
5. material inspection
6 qualification or preproduction testing
7. ground support and test equipment
8. transportation
9. security
10. storage
11. distribution
12. technical support

B. Research Study by Dillard & Inscoe on "Identification of the Management Cost Elements for CFE and GFE [10:34]."

1. mission support
2. procurement manpower
3. project division manpower
4. manufacturing operations manpower
5. configuration management manpower
6. data management manpower
7. engineering manpower
8. building maintenance manpower
9. transportation
10. project management manpower
11. quality assurance
12. contract administration manpower
13. property administration manpower
14. rent
15. general and administrative expense

C. GAO Report B-178214 on "Uniformed Decisions for Commercial Products are Costly," cited in an Army Procurement Research Report on CFE versus GFE (7:22).

1. requirements determination
2. order processing
3. procurement
4. transportation
5. receiving and storage
6. invoice and payment processing
7. credit returns
8. repackaging
9. distribution
10. inspection and quality control
11. indirect costs associated with personnel
12. depreciation
13. interest on investment in cash
14. receivables
15. inventory
16. real and personal property

D. Research Study on "Feasibility of Determining GFE/CFE Cost Effectiveness", U. S. Army Materiel Systems Analysis Activity, Army Procurement Research Office (6:10).

1. mission support
2. procurement manpower
3. project manpower
4. manufacturing operations manpower
5. configuration management manpower
6. data management manpower
7. engineering manpower
8. clerical
9. quality assurance manpower
10. contract administration manpower
11. property administration manpower
12. transportation
13. general and administration expenses

## Appendix E: Listing of Interviewees

Personal interviews were held with two groups of individuals -- professors at the Air Force Institute of Technology and component breakout managers from Aeronautical Systems Division. The selection of interviewees was based on their knowledge of component breakout policies and procedures. The interviewees were provided with a composite list of offsetting costs which were grouped into fourteen general cost categories. Comments were solicited regarding the comprehensiveness of the list and clarity of terms used for the cost categories. The interviewees are listed below:

Captain John Campbell, USAF
Assistant Professor of Contract Management
School of Systems and Logisitics
Air Force Institute of Technology
Wright-Patterson AFB, Ohio

Mr Thomas Campbell
Chief of Manufacturing Management Division
Directorate of Manufacturing/Quality Assurance
Aeronautical Systems Division (AFSC)
Wright-Patterson AFB, Ohio

Mr Richard Harstad
Chief of Government Support and Avionics Division
Directorate of B-1 Manufacturing/Quality Assurance
Aeronautical Systems Division (AFSC)
Wright-Patterson AFB, Ohio

Lieutenant Colonel Brian Maass, USA
Instructor of Contract Management
School of Systems and Logistics
Air Force Institute of Technology
Wright-Patterson AFB, Ohio

Lieutenant Colonel Dale Shields, USAF
Assistant Professor of Quantitative Methods
School of Systems and Logistics
Air Force Institute of Technology
Wright-Patterson AFB, Ohio

Mr Thomas Skaleski
Contracting Officer
F-15 Systems Group
Aeronautical Systems Division (AFSC)
Wright-Patterson AFB, Ohio

## Appendix F: Structured Interview Package

### Procedure

Each interviewee was provided with a structured interview package which consisted of a general information sheet and a questionnaire. The general information sheet was designed to aid the experts in completing the questionnaire. Examples of specific cost elements were provided on the information sheet for each of the fourteen general cost categories. The questionnaire contained the list of fourteen cost categories which formed the composite list of offsetting costs developed by the researchers. The experts were asked to rank the offsetting costs in order of importance. A comment section was also provided on the questionnaire.

Specific instructions for completing the questionnaire were provided on the questionnaire and the rankings were recorded right on the questionnaire.

When given the questionnaire, each expert was notified that the validity of the research results depended, in part, on the independence of the responses. The experts were asked not to discuss their individual rankings with other respondents. The experts were also informed that the questionnaire responses would be tabulated and reported in such a manner that no specific response could be attributed to any respondent.

Information Sheet

An Air Force Institute of Technology thesis team has undertaken a study to identify the offsetting costs associated with component breakout and to assess the importance of each offsetting cost to a breakout decision.

The researchers have conducted two reviews in order to identify the offsetting costs associated with component breakout. First, a review was conducted of component breakout file documentation maintained by the individual SPO's within ASD. This review provided the researchers with the offsetting costs that have been considered in previous breakout decisions. In order to ensure that a comprehensive list of offsetting costs would be identified, the researchers conducted a thorough literature review on component breakout. By combining the offsetting costs identified in the two reviews, a composite list of offsetting costs was developed.

During the reviews, the researchers found that in numerous cases different terminology was used to describe the same or similar offsetting cost. To alleviate this situation, the researchers chose to group like cost elements into cost categories. The fourteen general cost categories listed below are the result of combining like cost elements into general categories. The fourteen cost categories form the researchers' final composite list of offsetting costs. Also included for each cost category are examples of specific cost elements that fall into each cost category.

1. Administrative and Audit Personnel

| | |
|---|---|
| DLA | AFPRO |
| DCAA | NAVPRO |
| DCAS | APRO |

2. Air Force General and Administrative Expenses

| | |
|---|---|
| Staff Services | Training and Recruiting |
| Computer/ADP | Operating Supplies |

3. Air Force Overhead Expenses

| | |
|---|---|
| Building Maintenance | Utilities |
| Office Supplies | Furniture |

4. Data

Reprocurement (Acquisition) Data
Interface/Integration Data
Additional Contract Data Requirements (CDRLs)

5. Equipment/Tooling

   Special Tooling
   Special Test Equipment
   Support Equipment.

6. Manpower (For Component Breakout Team)

   | | |
   |---|---|
   | Program Manager | Production/Manufacturing |
   | Contracting | Logistics |
   | Pricing | Engineering |
   | SBA Specialist | |

   (Also included are management functions such as Interface Mgt, Program Mgt, and GFP Mgt)

7. Out-of-Station Production Costs

   Late/Defective GFP

8. Reprocurement Costs

   Preparation of Request for Proposal
   Committee Reviews
   Legal Reviews
   Clerical
   Management Briefings
   Source Selection

9. Security

10. Special Air Force Requirements

    Requirements of Socio-Economic Clauses
    EEO Compliance
    Warranties

11. Storage

    Components Delivered Ahead of Schedule

12. Technical Reviews

    Program Management Reviews
    Manufacturing Mgt Production/Capability Review
    Maintenance Engineering Analysis
    Production Readiness Reviews
    Preaward Surveys

    (TDY expenses make up part of the review costs)

13. Partial Termination of Prime Contractor

Continuation of Integration with Subcontractor

14. Transportation/Distribution

Receiving and Handling of Components
Inspection

EXPERT ____

## QUESTIONNAIRE

Instructions:

1. Rank the following fourteen offsetting costs in in decending order of "importance".

2. A rank of "1" should be given to the most important offsetting cost and a rank of "14" to the least important offsetting cost.

3. The rankings of "importance" should be based on the following definition:

IMPORTANCE is "the impact an offsetting cost has on the projected net cost savings of the breakout effort."

## CATEGORIES OF OFFSETTING COSTS

____ 1. Administrative and Audit Personnel

____ 2. Air Force General & Administrative Expenses

____ 3. Air Force Overhead Expenses

____ 4. Data

____ 5. Equipment/Tooling

____ 6. Manpower (Component Breakout Team)

____ 7. Out-of-Station Production Costs

____ 8. Reprocurement Costs

____ 9. Security

____ 10. Special Air Force Requirements

____ 11. Storage

____ 12. Technical Reviews

____ 13. Termination of Prime Contractor (Partial)

____ 14. Transportation/Distribution

Comments/Suggestions:

## Appendix G: Abbreviated Chi-Square Table

TABLE VIII

Chi-Square Table

| DEGREES OF FREEDOM | LEVEL OF SIGNIFICANCE .100 | .050 | .025 | .010 | .005 |
|---|---|---|---|---|---|
| 10 | 15.9871 | 18.3070 | 20.4831 | 23.2093 | 25.1882 |
| 11 | 17.2750 | 19.6751 | 21.9200 | 24.7250 | 26.7569 |
| 12 | 18.5494 | 21.0261 | 23.3367 | 26.2170 | 28.2995 |
| 13 | 19.8119 | 22.3621 | 24.7356 | 27.6883 | 29.8194 |
| 14 | 21.0642 | 23.6848 | 26.1190 | 29.1413 | 31.3193 |
| 15 | 22.3072 | 24.9958 | 27.4884 | 30.5779 | 32.8013 |
| 16 | 23.5418 | 26.2962 | 28.8454 | 31.9999 | 34.2672 |
| 17 | 24.7690 | 27.5871 | 30.1910 | 33.4087 | 35.7185 |
| 18 | 25.9894 | 28.8693 | 31.5264 | 34.8053 | 37.1564 |
| 19 | 27.2036 | 30.1435 | 32.8523 | 36.1908 | 38.5822 |

Source: (17:899)

## Bibliography


1. Barkley, Mark E. et al. AVSCOM'S Component Breakout Program Study. Report number AMSAV-D-75-8. St Louis MO: US Army Aviation Systems Command, August 1975.

2. Cohen, Jay Martin. Government-Furnished Equipment: An Analysis of the Decision Making Process. MS thesis. Naval Postgraduate School, Monterey, CA, September 1980 (AD-B053 585).

3. "Component Breakout in Weapon Systems Acquisition--AFAA," TIG Brief, 23:16 (July 1981).

4. Department of the Air Force. Component Breakout in Weapon Sustems Acquisitions. Air Force Audit Agency Report SRA 807510. Washington: AFAA, December 1980.

5. Department of the Army. Breakout in the Procurement Process. Audit Report MW 75-78. U.S. Army Audit Agency Midwestern District, 27 June 1975.

6. -----. Feasibility of Determining GFE/CFE Cost Effectiveness. APRO 84-55. Fort Lee VA: Army Procurement Research Office, January 1984.

7. -----. Contractor-Furnished Equipment Versus Government Furnished Equipment. APRO 80-10. Fort Lee VA: Army Procurement Research Office, May 1981.

8. Department of Defense. Component Breakout. DAR 1-326. Washington: Government Printing Office, July 1976.

9. -----. Component Breakout. FAR Supplement 17.7202. Washington: Government Printing Office, 1984.

10. Dillard, Captain Billy D. and Captain Philip D. Inscoe. Identification and Definition of the Management Cost Elements for Contractor Furnished Equipment and Government Furnished Equipment. MS Thesis, LSSR 22-78B. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1978 (AD-A061 300).

11. Drinnon, James W. "Assessing the Effect of Competition in Weapon System Acquisition." Defense Management Journal, 18: 29-31 (Second Quarter 1981).

12. Fox, J. Ronald. Arming America: How the U.S. Buys Weapons. Boston: Harvard University Press, 1974.

13. Gansler, Jacques S. The Defense Industry. Cambridge MA: The MIT Press, 1980.

14. Harstad, R. Chief, Support and Avionics Division. Personal Interviews. Directorate of B-1 Manufacturing/Quality Assurance, Wright-Patterson AFB OH, January through July 1984.

15. Kruchten, Major Robert J. "Competition: Does It Lower the Cost to the Government?" Concepts, 5: 111-115 (Spring 1982).

16. McCann John A. et al. Compendium of Authenticated Systems and Logistics Terms, Definitions, and Acronyms. Wright-Patterson AFB OH: School of Systems and Logistics, Air Force Institute of Technology (AU), 1 April 1981.

17. McClave, James T. and P. George Benson. Statistics for Business and Economics. California: Dellen Publishing Company, 1982.

19. Scherer, Frederick M. The Weapons Acquisition Process: Economic Incentives. Boston: Harvard University Press, 1964.

20. Siegel, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company, 1956.

21. The Diebold Group Inc. Military Logistics Management Indices. LMI Project 6E. Washington DC, August 1962.

22. Tobias, Sheila et al. What Kinds of Guns Are They Buying for Your Butter? New York: William Morrow & Co, Inc., 1982.

23. U.S. House of Representatives, Committee on Appropriations, Surveys and Investigations Staff. Weapons Systems Subcontractor Practices of the Department of Defense. A Report to the Committee on Appropriations. Washington: Government Printing Office, April 1980.

24. U.S. House of Representatives. Report of the Committee on Appropriations Together with Additional Views. Department of Defense Appropriation Bill, 1980. Washington: Government Printing Office, 20 September 1979.

25. U.S. Senate, Committee on Government Operations, Permanent Subcommittee on Investigations. Pyramiding of Profits and Costs in the Missile Procurement Program. Hearings, 17 April 1962. Washington: Government Printing Office. 1962.

26. Young R. S. and T. M. O'Hern. Missile Acquisition Study, Final Report. LMI TASK NA801. Logistics Management Institute, Washington DC, August 1979.

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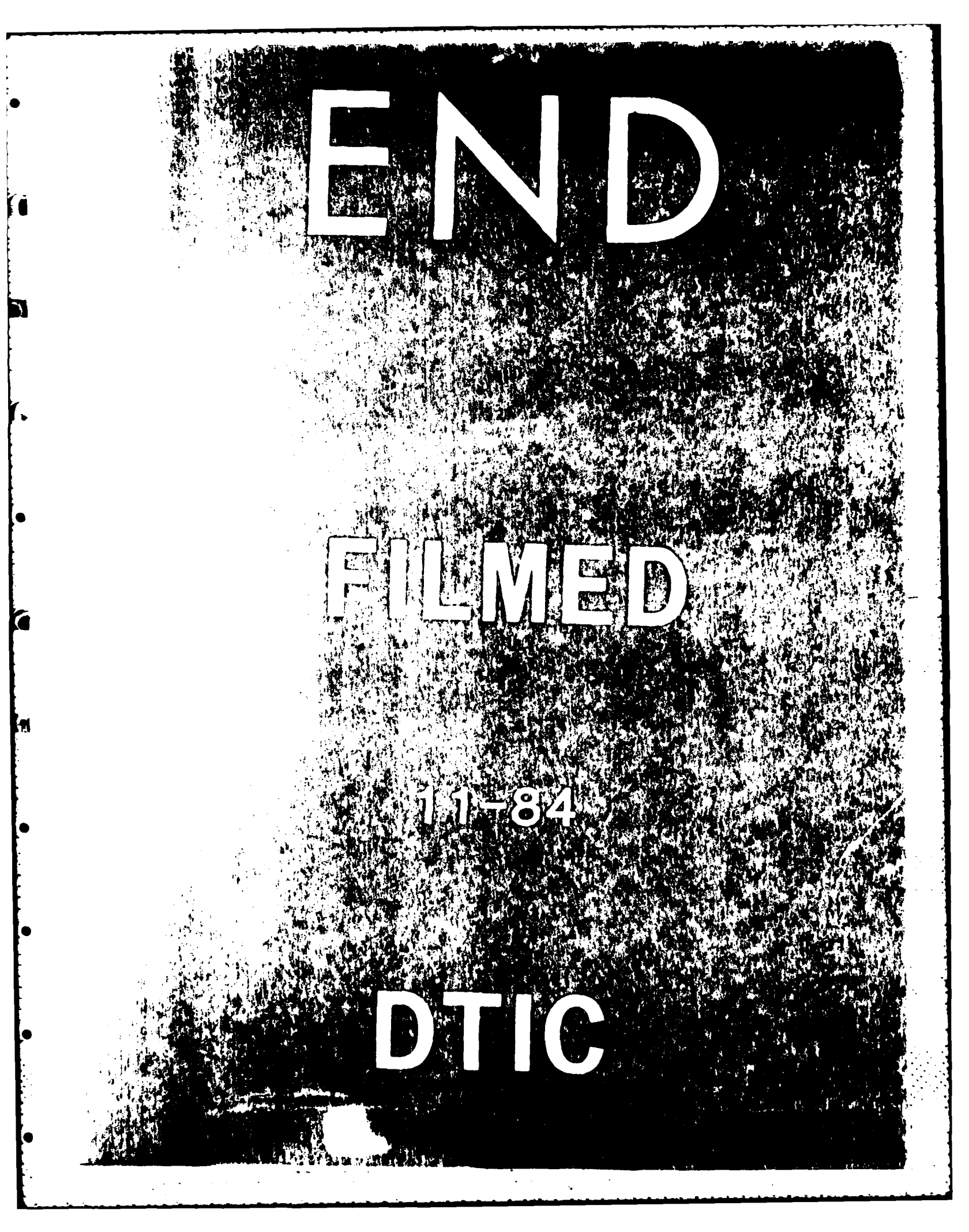
Twelve guidelines are provided in DAR and DOD FAR Supplement for assessing the risks and benefits of component breakout. One of the guidelines identifies examples of offsetting costs that should be considered when estimating the potential cost savings of component breakout. However, this list is not inclusive of all the costs that offset the potential cost savings of component breakout. This research effort proposes a composite list of offsetting costs associated with component breakout and provides an assessment of the importance of each offsetting cost to a breakout decision.

The researchers identified, through a review of contract files, and a search of literature, fourteen general categories of offsetting costs. Twenty-one component breakout experts were then asked to rank the offsetting costs. By ranking the offsetting costs, the researchers were able to determine the relative importance of each offsetting cost to a breakout decision.

A nonparametric statistical test was conducted by the researchers to determine the agreement among the experts on the importance of each offsetting cost to a breakout decision. The results of the test indicate that the twenty-one experts generally agree on the importance of each offsetting cost. Manpower was identified as the most important offsetting cost.

The first essential step to establishing a realistic estimate of the potential cost savings of component breakout is to identify the offsetting costs. The next step is to evaluate each offsetting cost using a method of analysis that accurately predicts the impact of the particular cost. However, neither quantitative nor qualitative guidance has been developed for analyzing offsetting costs.

The researchers recommend that methodologies be developed to forecast and evaluate each offsetting cost. Lacking such methodologies, not only is the potential for misjudgment of cost savings high, but erroneous breakout decisions could result.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